installation guide

hp StorageWorks core switch 2/64

Product Version: 4.1.x

Third Edition (June 2003)

Part Number: AA-RS2WC-TE

This installation guide provides procedures for setting up, configuring, and managing the Core Switch 2/64 and Core Switch 2/64 power pak.

For the most current information about the HP StorageWorks Core Switch 2/64, visit the support Web site located at http://www.hp.com/products1/storage/products/san/fibreswitches/coreswitch2_64/index.html.

Printed in the U.S.A.

Core Switch 2/64 V4.1 Installation Guide
Third Edition (June 2003)
Part Number: AA-RS2WC-TE

contents

Figures

Tables

about this guide

This user guide provides information to help you:

- Set up and configure StorageWorks Core Switch 2/64
- Maintain and operate the switch
- Contact technical support for additional assistance

Intended Audience

This book is intended for use by customers who purchased the Core Switch 2/64, the Core Switch 2/64 power pak, and for authorized service providers who are experienced with the following:

- Configuration aspects of customer Storage Area Network (SAN) fabric
- Customer host environments, such as Windows or IBM AIX
- Web Tools Graphical User Interface (GUI), for configuring the switch via a supported Web browser

Related Documentation

For the most current information about the HP StorageWorks Core Switch 2/64, visit the support Web site located at:

http://www.hp.com/products1/storage/products/san/fibreswitches/coreswitch2_64/index.html.

For information about product availability, configuration, and connectivity, consult your HP account representative.

Conventions

Conventions consist of the following:

- Document Conventions
- Text Symbols

Document Conventions

The document conventions included in Table 1 apply in most cases.

Table 1: Document Conventions

Element	Convention
Cross-reference links	Blue text: Figure 1
Key and field names, menu items, buttons, and dialog box titles	**Bold**
File names, application names, and text emphasis	*Italics*
User input, command and directory names, and system responses (output and messages)	`Monospace font` `COMMAND NAMES` are uppercase monospace font unless they are case sensitive
Variables	*`<monospace, italic font>`*
Website addresses	Blue, underlined sans serif font text: http://www.hp.com

Text Symbols

The following symbols may be found in the text of this guide. They have the following meanings.

WARNING: Text set off in this manner indicates that failure to follow directions in the warning could result in bodily harm or loss of life.

Caution: Text set off in this manner indicates that failure to follow directions could result in damage to equipment or data.

Note: Text set off in this manner presents commentary, sidelights, or interesting points of information.

Equipment Symbols

The following equipment symbols may be found on hardware for which this guide pertains. They have the following meanings.

Any enclosed surface or area of the equipment marked with these symbols indicates the presence of electrical shock hazards. Enclosed area contains no operator serviceable parts.

WARNING: To reduce the risk of injury from electrical shock hazards, do not open this enclosure.

Any RJ-45 receptacle marked with these symbols indicates a network interface connection.

WARNING: To reduce the risk of electrical shock, fire, or damage to the equipment, do not plug telephone or telecommunications connectors into this receptacle.

Any surface or area of the equipment marked with these symbols indicates the presence of a hot surface or hot component. Contact with this surface could result in injury.

WARNING: To reduce the risk of injury from a hot component, allow the surface to cool before touching.

Power supplies or systems marked with these symbols indicate the presence of multiple sources of power.

WARNING: To reduce the risk of injury from electrical shock, remove all power cords to completely disconnect power from the power supplies and systems.

Any product or assembly marked with these symbols indicates that the component exceeds the recommended weight for one individual to handle safely.

WARNING: To reduce the risk of personal injury or damage to the equipment, observe local occupational health and safety requirements and guidelines for manually handling material.

Rack Stability

Rack stability protects personnel and equipment.

WARNING: To reduce the risk of personal injury or damage to the equipment, be sure that:

- The leveling jacks are extended to the floor.
- The full weight of the rack rests on the leveling jacks.
- In single rack installations, the stabilizing feet are attached to the rack.
- In multiple rack installations, the racks are coupled.
- Only one rack component is extended at any time. A rack may become unstable if more than one rack component is extended for any reason.

Getting Help

If you still have a question after reading this guide, contact an HP authorized service provider or access our website: http://www.hp.com.

HP Technical Support

In North America, call technical support at 1-800-652-6672, available 24 hours a day, 7 days a week.

Note: For continuous quality improvement, calls may be recorded or monitored.

Outside North America, call technical support at the nearest location. Telephone numbers for worldwide technical support are listed on the HP website under support: http://www.hp.com/support/.

Be sure to have the following information available before calling:

- Technical support registration number (if applicable)
- Product serial numbers
- Product model names and numbers
- Applicable error messages
- Operating system type and revision level
- Detailed, specific questions

HP Storage Website

The HP website has the latest information on this product, as well as the latest drivers. Access storage at:

http://www.hp.com/country/us/eng/prodserv/storage.html.

From this website, select the appropriate product or solution.

HP Authorized Reseller

For the name of your nearest HP authorized reseller:

- In the United States, call 1-800-345-1518
- In Canada, call 1-800-263-5868
- Elsewhere, see the HP website for locations and telephone numbers: http://www.hp.com.

Overview

1

The HP StorageWorks Core Switch 2/64 is a high-performance switch for large SANs, providing 32 to 128-ports (a 128-port switch is configured as two 64-port switches in a single chassis).

The HP StorageWorks Core Switch 2/64 is offered in two configurations: the 2/64 and 2/64 Power Pak. Refer to the *HP StorageWorks Core Switch 2/64 Version 4.1 Release Notes* for a complete list of management features enabled on your specific switch.

Note: This guide refers to both models as the Core Switch 2/64, unless otherwise noted.

This chapter provides the following information:

High Availability

High availability features of this switch include:

- Two redundant hot-swappable control processor (CP) cards with automatic failover and non-disruptive software upgrades
- Non-disruptive software upgrades for Fabric OS v4.1
- Up to eight hot-swappable 16-port cards
- Four hot-swappable power supplies (redundant pair configuration)
- Three hot-swappable blower assemblies (two required for adequate cooling)
- WWN card that is hot-swappable in Fabric OS V4.1
- Two redundant AC inputs

The HP StorageWorks Core Switch 2/64 includes the Fabric Operating System version 4.1 or later. It can operate as the only switch in a fabric or in a fabric containing multiple switches.

Firmware Version 4.0 Summary

The Core Switch 2/64 operates using Fabric Operating System (FOS) firmware Version 4.1 or later. The firmware supports:

- High-speed data traffic using Interswitch Link (ISL) trunking technology
- Automatic re-routing through the Fabric Shortest Path First (FSPF) algorithm
- Application Programming Interface (API); a protocol that allows applications to interface with switch services.
- Per port statistics help technicians diagnose and isolate problem ports without disrupting switch operations.
- Error detection and fault isolation, automatically disables failing ports and restarts when the problem is resolved.

Zoning functionality, provides a means to allocate storage controllers to groups of computers. Allows you to create logical subsets of the fabric to accommodate closed user groups or to create functional user groups within a fabric. For the most current information about the HP StorageWorks Core Switch 2/64, visit the HP support Web site at: http://www.hp.com/products1/storage/products/san/fibreswitches/coreswitch2_64/index.html.

- For information about product availability, configuration, and connectivity, consult your HP account representative.
- Industry standard Management Information Base (MIB) support.
- Automatic self-discovery, discovers and registers host server and storage devices.
- Web Tools is a GUI to that manages the SAN from a browser, such as Internet Explorer or Netscape.

Port Side of Chassis

The Fibre Channel ports support link speeds of 1 and 2 Gbits/sec (inbound and outbound), and automatically negotiate to the highest common speed of all devices connected to the port. They are compatible with short wave-length and long wave-length SFP (small form factor pluggable) transceivers, universal and self-configuring, and are capable of individually becoming FL_Ports (fabric loop ports), F_Ports (fabric ports), or E_Ports (expansion ports).

The Core Switch 2/64 consists of the following components:

- A 14U chassis, designed for installation in a standard 19-inch rack. Up to two switches may be mounted in a standard 42U rack.
- Two 16-port cards per chassis, with:
  - 16 optical ports per card, compatible with Small Form Factor Pluggable (SFP) media
- Two Control Processor (CP) cards, each with:
  - One modem serial port with a DB-9 connector (full RS-232)
  - One terminal serial port with a DB-9 connector (RS-232 signal subset)
  - One IEEE compliant RJ-45 connector for use with a 10/100 Mbps Ethernet connection
  - A real-time clock (RTC) with a 10-year battery and 56 bytes of NVRAM
- Four power supplies with built-in fans
- Two AC power inlet connectors with AC power switches
- A World Wide Name (WWN) card and bezel
- Three blower assemblies for forced-air cooling, that flows from the blower side of the chassis to the port side of the chassis

Figure 1 identifies port side components. See Table 1 for component descriptions.

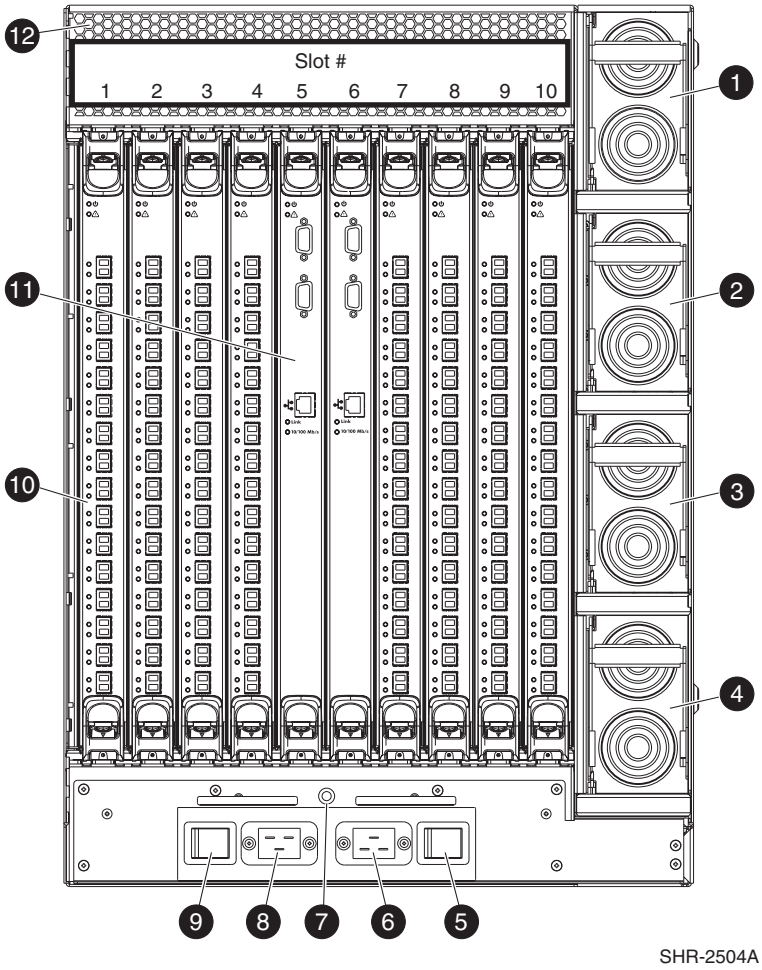


Figure 1: Port side of the Core Switch 2/64

Note: Figure 1 shows a fully populated switch (eight 16-port cards installed). However, the Core Switch 2/64 actually ships with two 16-port cards installed in slots 1 and 2 only. To increase the number of ports, purchase the Core Switch 2/64 Port Module Upgrade Kit. See Table 3 for specific kit ordering information.

Table 1: Port Side Component Descriptions

Item	Summary
❶ Power supply #4	Powers right side of AC branch, slot 6 through slot 10.
❷ Power supply #3	Powers left side of AC branch, slot 1 through slot 5.
❸ Power supply #2	Powers right side of AC branch, slot 6 through slot 10.
❹ Power supply #1	Powers left side of AC branch, slot 1 through slot 5.
❺ AC power switch	Activates power supplies #2 and #4.
❻ AC power connector	Connects power for right side of switch.
❼ Grounding strap connector	Attaches the ESD grounding strap supplied with the switch.
❽ AC power connector	Connects power for left side of switch.
❾ AC power switch	Activates power supplies #1 and #3.
❿ 16-port card	The switch ships with two 16-port cards installed. Each card provides sixteen auto-sensing Fibre Channel ports, for a total of thirty two ports.
⓫ CP card	The switch ships with two CP cards per chassis. Each card houses a modem serial port, terminal serial port, and a 10/100 Mbps Ethernet port.
⓬ Exhaust vent	Vents air from the power supplies.

Core Switch 2/64 Fibre Channel Ports

Fibre channel port specifications include:

- Support full duplex link speeds at 2.125 Gbps or 1.0625 Gbps (inbound and outbound).
- Automatically negotiate to the highest common speed of all devices connected to the port.
- Operate with short wave length (780-850) and long wave length (1270-1350 nm) Small Form Factor Pluggable (SFP) media transceivers, and SFP-compatible cables.
- Provide a SerDes (serializer/de-serializer), which accepts 10-bit wide parallel data and serializes it into a high-speed serial stream.
- Are capable of individually becoming fabric loop ports (FL_Ports), fabric ports (F_Ports), or expansion ports (E_Ports).
- Use color-coded labels to indicate which ports are used in the same ISL trunking group.
- Conform to the American National Standards Institute (ANSI) Fibre Channel, FC-PI specification for Fibre Channel SFP transceivers.

Blower Assembly Side of Chassis

Figure 2 identifies components on the blower assembly side of the chassis, which provides access to the following components:

- WWN card and bezel: Provides LED for monitoring switch from the blower assembly side and persistently stores WWN, IP addresses, switch name, and serial number.
- Blower assemblies: Includes three blower assemblies, individually hot-swappable.

See Table 2 for component descriptions.

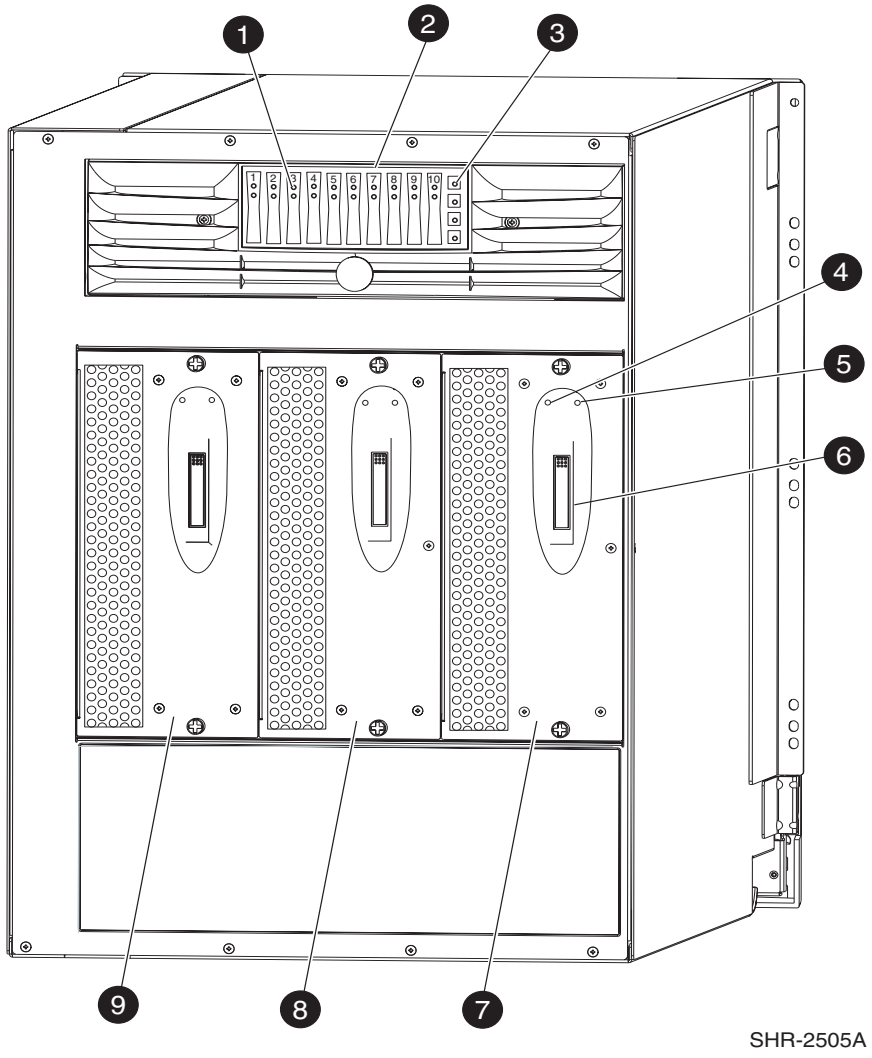


Figure 2: Blower side components

Table 2: Blower Side Component Descriptions

Item	Summary
❶ Port card and CP card LEDs	Indicate 16-port card and CP card status.
❷ WWN card and bezel assembly	Monitors CP card, 16-port card and power supply status from the blower assembly side of the chassis. The WWN card also stores the chassis serial number and IP addresses assigned to the CP card slots.
❸ Power supply LEDs	The three power supply LEDs include the power LED, predictive failure LED, and failure LED.
❹ Blower power LED	Indicates blower assembly power off or on.
❺ Blower fault LED	Indicates blower assembly malfunctioning.
❻ Blower handle (1 of 3)	Use handle to remove a faulty blower assembly. See Chapter 4, Installing Core Switch 2/64 FRUs, on page 121 for complete replacement instructions.
❼ Blower assembly #3	Provides cooling for the blower assembly side of the chassis
❽ Blower assembly #2	Provides cooling for the blower assembly side of the chassis
❾ Blower assembly #1	Provides cooling for the blower assembly side of the chassis

Cabling Summary

The following sections describe cabling requirements.

Fibre Optic Cable Requirements

Each 16-port card slot supports up to sixteen fiber optic transceivers and cables that convert electrical signals to optical signals and back. Each SFP transceiver supports 850nm Short Wave Length (SWL) on multimode fiber optic cable, or 1310 nm Long Wave Length (LWL) on single mode fiber optic cable. The strength of the signal is determined by the type of SFP in use.

Managing Cables

It is important to plan how to route switch cables through the Core Switch 2/64, so that cables are not compromised. Follow these cabling guidelines:

- Route fiber optic cables directly downwards, instead of across adjacent cards or in front of the power supplies. This prevents having to disconnect cables when removing neighboring cards, and also keeps LEDs visible.
- Leave at least one meter of slack for each fiber optic cable. This provides room to remove and replace the 16-port card, allows for inadvertent movement of the rack, and helps prevent bending the cables.
- Use the cable guides provided with the Core Switch 2/64 to group cables by trunking ports (groups of four neighboring ports, or quads). These guides help to keep individual ports accessible by keeping the cables evenly spaced, and also provide clearance for the removal of a neighboring card.
- Do not route cables in front of the exhaust vent (located at the top of the port side of the chassis).

Cable Management Tray and Cable Guides

The Core Switch 2/64 ships with two items to assist with cable management:

- Cable management tray—The cable management tray is attached to the bottom of the chassis, and routes the cables down below the chassis, or out the sides of the chassis.
- Cable guides—A set of sixteen cable guides ship with the Core Switch 2/64. Cable guides serve to keep the cables evenly spaced, and to hold them away from the 16-port cards, simplifying card replacement. Use the cable guides to organize the port cables into logical groups, (for example, according to port quads). The cable guides are free-floating and do not attach to the chassis.

Cabling Precautions

Follow these important cabling guidelines:

- Do not route the cables in front of the air exhaust vent, which is located at the top of the port side of the chassis.
- Do not use tie wraps. Tie wraps are not recommended for optical cables because they are easily overtightened, leading to potential ruptures in the cables.

Management Summary

The Core Switch 2/64 can be managed in-band using Fibre Channel protocol, or out-of-band by connecting to the Ethernet port. The management functions allow the administrator to monitor fabric topology, port status, physical status, and performance statistics.

The Core Switch 2/64 is compatible with the following management interfaces:

- Command Line Interface (CLI) through a telnet connection
- Web Tools, an integrated GUI
- SNMP applications

Optional Management Features

Refer to the *HP StorageWorks Core Switch 2/64 Version 4.1 Release Notes* for a complete list of management and optional software features enabled on the switch.

Optional Hardware Kits

Table 3 includes the optional hardware kits in support of the Core Switch 2/64, see .

Table 3: Core Switch 2/64 Orderable Hardware

Accessory	Part Number
Short wavelength SFP	A6515A* or 300834-B21**
Long wavelength SFP, 10 km	A6516A* or 300835-B21**
2m LC-to-LC Fibre Channel (fc) cable	C7524A*
2m LC-to-LC multi-mode fc cable	221692-B21**
16m LC-to-LC fc cable	C7525A*
5m LC-to-LC multi-mode fc cable	221692-B22**
50m LC-to-LC fc cable	C7526A*
15m LC-to-LC multi-mode fc cable	221692-B23**
200m LC-to-LC fc cable	C7527A*
30m LC-to-LC multi-mode fc cable	221692-B26**
50m LC-to-LC multi-mode fc cable	221692-B27**
2m LC-to-SC fc cable	C7529A*
2m LC-to-SC multi-mode fc cable	221691-B21**
16m LC-to-SC fc cable	C7530A*
5m LC-to-SC multi-mode fc cable	221691-B21**
15m LC-to-SC multi-mode fc cable	221691-B23**
30m LC-to-SC multi-mode fc cable	221691-B26**
50m LC-to-SC multi-mode fc cable	221691-B27**
SC female to SC female adapter	C7534A*
2m LC male to SC male adapter kit	C7534A*

* premerger HP part number

** premerger Compaq part number

Managing and Monitoring the Core Switch 2/64

You can use a variety of applications to manage and monitor the Core Switch 2/64.

Managing the Core Switch 2/64

You can use the management functions built into the Core Switch 2/64 to monitor the fabric topology, port status, physical status, and other information to aid in performance analysis and system debugging.

You can manage the Core Switch 2/64 using any of the management options listed in Table 4. For information about inband support, contact the switch provider.

The Core Switch 2/64 includes the Fabric OS and is compatible with HP StorageWorks 1 Gb and 2 Gb SAN switches.

Note: For information about upgrading the Fabric OS, refer to the *HP StorageWorks Fabric OS Procedures Version 3.1.x/4.1.x User Guide* or the *HP StorageWorks Fabric Manager User Guide*.
For information about diagnostic tests and error messages, refer to the *Diagnostic and System Error Message Reference*.

Table 4 lists the Core Switch 2/64 management tools.

Table 4: Management Options for Core Switch 2/64

Management Tool	Out-of-band Support
Command line interface For ethernet, up to two admin sessions and four user sessions at same time. For details, refer to the *HP StorageWorks Fabric OS Procedures Version 3.1.x/4.1.x User Guide* and the *HP StorageWorks Fabric OS Version 3.1.x/4.1.x Reference Guide*. Sectelnet and Secure Shell clients are both supported.	Ethernet or serial connection
Fabric Manager Fabric Manager v3.0.2c or later required. For information refer to the *Fabric Manager User Guide*.	Ethernet
Web Tools For information refer to the *HP StorageWorks Web Tools Version 3.1.x/4.x.1 User Guide*.	Ethernet
Standard SNMP applications For information refer to the *HP StorageWorks MIB Version 3.1.x/4.1.x Reference Guide*.	Ethernet
Management server For information about MS, refer to the *HP StorageWorks Fabric OS Procedures Version 3.1.x/4.1.x User Guide* and the *HP StorageWorks Fabric OS Version 3.1.x/4.1.x Reference Guide*.	Ethernet

Supported Features

The Core Switch 2/64 supports the following software features.Refer to the *HP StorageWorks Core Switch 2/64 Version 4.1 Release Notes* to determine which features require purchasing a license key for activation.

- Web Tools —refer to the *HP StorageWorks Web Tools Version 3.1.x/4.1.x User Guide*.
- Zoning —refer to the *HP StorageWorks Zoning Version 3.1.x/4.1.x User Guide*.
- Secure Fabric OS —refer to the *HP StorageWorks Secure Fabric OS Version 1.0 User Guide*.
- ISL Trunking —refer to the *HP StorageWorks ISL Trunking Version 3.1.x/4.1.x User Guide*.

- Fabric Watch —refer to the *HP StorageWorks Fabric Watch Version 3.1/4.1 User Guide*
- Performance Monitoring —refer to the *HP StorageWorks Advanced Performance Monitoring Version 3.1.x/4.1.x User Guide*.
- Extended Fabric —refer to the *HP StorageWorks Extended Fabric Version 3.1.x/4.1.x User Guide*
- Remote Switch —refer to the *HP StorageWorks Remote Switch Version 3.1.x/4.1/x User Guide*

Installing and Configuring the Core Switch 2/64

2

The Core Switch 2/64 is 14 rack units in height and can be installed as follows:

- Set up as a stand-alone unit on a flat surface
- Installs in a 19 inch EIA (Electronic Industries Association) cabinet, using the 14U Rack Mount Kit provided with the Core Switch 2/64 (detailed instructions included with kit). You can install up to two Core Switch 2/64 units in a 42U EIA cabinet.
- Installs in a mid-mount (Telco) rack, using the Mid-mount Rack Kit, available from the HP supplier (detailed instructions included with kit)

This chapter provides the following information:

Use the following procedures in this chapter to set up and configure the Core Switch 2/64:

- Provides a carton contents checklist
- Lists installation requirements
- Outlines how to install the Core Switch 2/64 as a standalone unit, or in a 9000 Series, 42U or comparable rack
- Outlines how to install the Core Switch 2/64 in the optional HP System/e Rack
- Describes how to configure Core Switch 2/64 network addressing
- Describes how to check POST results to verify that the switch is up and running in the SAN
- Summarizes the Core Switch PID format
- Outlines how to connect the Core Switch 2/64 to the Local Area Network (LAN)
- Describes how to connect SFPs
- Setting up Speed Negotiation

Installation and Safety Considerations

WARNING: For safety reasons, when installing this product in an equipment rack, you must consider rack stability against tipping. Please refer to the user manual provided with the equipment rack to determine rack stability (available through the HP Web site at: http://www.hp.com/racksolutions/prodinfo/racks/index.html).
If the necessary stability is not achieved, through the placement of additional equipment or ballast, the equipment rack must be anchored to the building structure before operation.

WARNING: A fully populated HP StorageWorks Core Switch 2/64 weighs approximately 250 pounds (113 kg) and requires a minimum of two people and mechanical lift to install it.

Before installing, verify that the additional weight of the chassis does not exceed the cabinet's weight limits or unbalance the cabinet, including when some of the cards or power supplies are partially extended out of the chassis.

Caution: To ensure adequate cooling, install the chassis with the port side facing the aisle into which exhaust air is released (usually called the service aisle). This prevents the fans from pulling in heated exhaust air.

You must complete the following steps to ensure correct installation and operation:

- Provide a space that is 14U high, 29 inches deep, and 19 inches wide (IU = 1.75 inches). Also provide an additional 1U for cable management.
- If installing in a cabinet:
  - Ensure the space in the 19 inch (48.3 cm) EIA cabinet is 14U high, with a minimum distance of 28.25 inches (71.76 cm) between the front and back rails, and a maximum distance of 29.88 inches (75.90 cm).
  - Verify that the additional weight of the chassis does not exceed the cabinet's weight limits.
  - Ensure that all equipment installed in the cabinet is grounded through a reliable branch circuit connection. Do not rely on a secondary connection to a branch circuit, such as a power strip.

- Ensure that two dedicated electrical branch circuits with the following characteristics are available for use:
  - 200 to 240 VAC, 50 - 60 Hertz.
  - Protected by a circuit breaker in accordance with local electrical codes.
  - Supply circuit, line fusing, and wire size that are adequate according to the electrical rating on the chassis nameplate.
  - Grounded outlets installed by a licensed electrician and compatible with the power cords.
  - Located close to the 14U HP StorageWorks Core Switch 2/64 chassis and easily accessible.

Note: To maximize fault tolerance, connect each power cord to a separate power source.

- Ensure the HP StorageWorks Core Switch 2/64 has access to a minimum airflow of 350 cubic feet per minute.
- Ensure the air temperature measured at the blower inlet does not exceed 40 degrees Celsius during operation.

Unpack and Verify Carton Contents

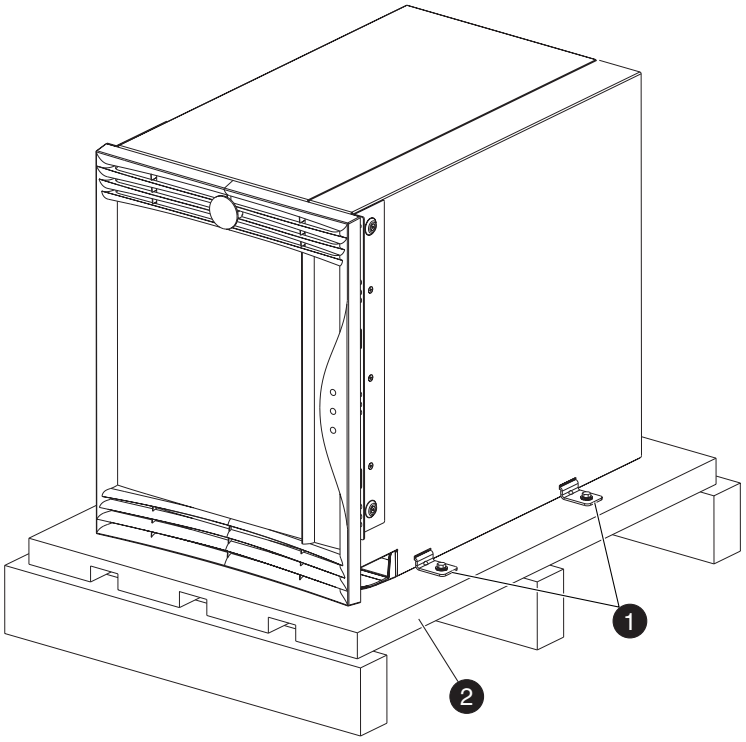
Use these steps to unpack and verify Core Switch 2/64 shipping carton contents.

Note: Obtain a 1/2 inch socket wrench to remove the pallet bolts.

1. Remove the upper portion of the packing crate while the switch is still in the shipping area to reduce clutter at the installation site.
   a. Open the latches that hold the top of the crate to the pallet. To open a latch, pull the handle out, turn it to the left, then slide the latch open.
   b. Lift the top of the crate off the pallet.

Note: Leave the foam on top of the chassis to hold the kits in place during transportation to the installation area.

2. Remove the packing foam, antistatic plastic, 14U Rack Mount Kit, and Accessory Kit.
3. Locate the hinges on the crate. Remove the crate hinges as follows:
   a. Pull the handle out, and turn counter-clockwise.
   b. Slide the hinge open and lift up.
4. Unscrew the four bolts securing the Core Switch 2/64 to the pallet. See Figure 3.



❶ Pallet bolts (two on each side)
❷ Pallet

Figure 3: Releasing the crate from the pallet

5. Remove the brackets.

> **Caution:** You must remove the chassis door before lifting the chassis off the pallet. See the section Removing the Chassis Door on page 45.

6. Verify that the carton contains the items shown in Figure 4 and Table 5.

Note: If any items are damaged or missing, please contact your authorized reseller.

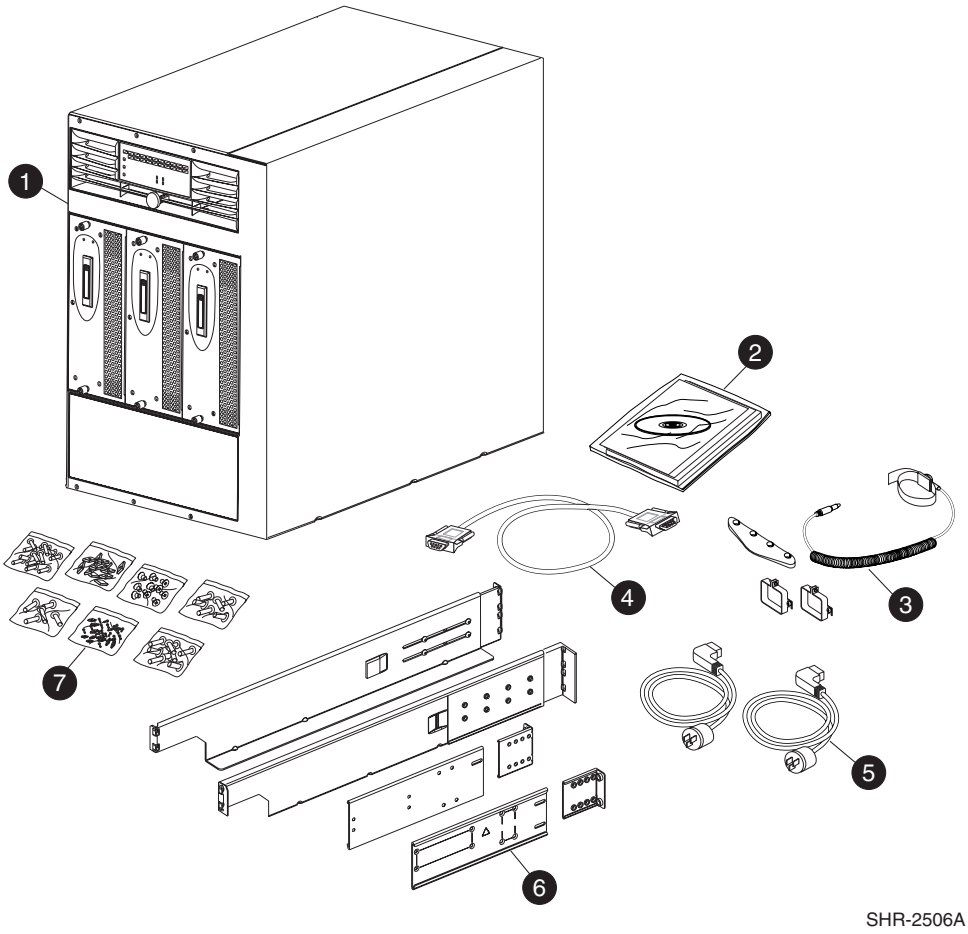


Figure 4: Core Switch 2/64 carton contents

Note: Additional mounting hardware may be included with the switch for mounting in HP racks.

Table 5: Core Switch 2/64 Carton Contents Checklist

Item	Summary
❶	Core Switch 2/64 populated with two 16-port cards, two CP cards, four power supplies and three blower assemblies.
❷	*StorageWorks Fibre Channel Core Switch 2/64 Installation Guide, Release Notes*, software CD, and license
❸	One Accessory Kit containing one ESD grounding strap, sixteen cable guides, and two power cord retainers, with Phillips screws (#4-40), and #1 Phillips screwdriver as a required tool
❹	RS-232 serial cable with an RJ-45 adapter
❺	AC power cords (2) Currently two set of power cords that are shipped with the Core Switch 2/64 switch. One set is for pmHP & the other set is for pmCPQ. For the pmHP Core Switch, two jumper cables (C19 – C20) are provided to connect from the switch to the PDU. The PDU that we recommend is E7671A. Two E7671A are recommended for power redundancy. The recommended power cords to connect from the PDU to the wall are E7803A, E7805A, E7806A, E7808A, E7809A. Both are standard US receptacles. These cables are then plugged into a PDU (Power Distribution Unit) in the rack, which is customized by country.
❻	14U Rack Mount Kit containing: Left rack mount shelf bracket, (1); Right rack mount shelf bracket, (1) • Left upper rack mount bracket assembly, includes: Left upper rack mount bracket (flat); Left upper rack mount bracket (L-shaped); Screw (torque to 32 inch-pounds) • Right upper rack mount bracket assembly, includes: Right upper rack mount bracket (flat); Right upper rack mount bracket (L-shaped); Screw (torque to 32 inch-pounds) • M5 Tinnermans (0590-2318) and M5 Torx screws (0515-0671) are required pieces of rack mount kit hardware.
❼	• Seven pouches containing 14U Rack Mount Kit hardware; #10-32 x 5/16 Phillips flathead screws (8); #10-32 x 5/16 Phillips panhead screws with washers (4) • For use with the 9000 Series 42U rack (or racks with square holes): #10-32 x 5/16 retainer nuts; #1/4-20 x 0.500 Phillips panhead screws with glue (16); 0.375-inch square washers (16) • For use with rack with round holes: #10-32 clip nut (package of 20, only 4 required); #1/4-20 x 1/2 inch Phillips panhead screws, with lockhead washers (16)

Installation Overview

Install the Core Switch 2/64 in one of the following ways

- As a standalone unit on a stable table or lab workbench
- In a rack using the 14U Rack Mount Kit supplied with the switch
- As a fixed component in the System/e rack

Selecting an Operating Location

Verify that the switch location meets the following requirements:

- Adequate supply circuit, line fusing, and wire size, as specified by the electrical rating on the switch nameplate.
- Air flow of at least 350 cubic feet per minute, available in the immediate vicinity of the Core Switch 2/64.
- If installing the switch in the 9000 Series rack, or comparable Electronics Industries Association (EIA) rack:
  - — All equipment installed in the rack should have a reliable branch circuit ground connection, and should not rely on a connection to a branch circuit, such as a power strip.
  - — The rack should be balanced and the installed equipment within the rack's weight limits. Ensure that the rack is mechanically secured to insure stability in the event of an earthquake.

Cooling Requirements

Install the switch so that air intake and exhaust for all components in the rack is flowing in the same direction.

Note: To ensure adequate cooling, install the chassis with the port side facing the aisle into which exhaust air is released (usually called the "service aisle"). This prevents the fans from pulling in heated exhaust air.

Power Requirements

Two AC power cords connect to the switch. The AC power source must meet these requirements:

Note: Installing each power cord using two separate sources ensures power supply redundancy.

- 200 to 240 VAC, 50 - 60 Hertz
- Protected by a circuit breaker in accordance with local electrical codes
- Supply circuit, line fusing, and wire size that are adequate according to the electrical rating on the chassis nameplate
- Grounded AC outlets installed by a licensed electrician and compatible with the power cords

The switch includes a universal power supply capable of functioning worldwide without voltage jumpers or switches. The power supply is auto ranging in terms of accommodating input voltages and line frequencies.

Two jumper cables (C19 – C20) are provided to connect from the switch to the PDU. The recommended PDU is E7671A. Two E7671A PDUs are recommended for power redundancy. The recommended power cords to connect from the PDU to the wall are E7803A, E7805A, E7806A, E7808A, E7809A.

It is not recommended to connect the switch to the wall because it would require two dedicated wall outlets. Using the PDU, a customer can connect more devices to a power source.

Installing the Switch as a Stand-alone Unit

The following items are required for this setup:

- Core Switch 2/64
- AC power cords and cables supplied with the switch

Caution: You must remove the chassis door before lifting the chassis off the pallet. See the next section, Removing the Chassis Door, on page 45.

Removing the Chassis Door

You must remove the chassis door before lifting the switch off the pallet. Use these steps to remove the chassis door.

Note: To ensure adequate cooling, install the chassis with the port side facing the aisle into which exhaust air is released (usually called the "service aisle"). This prevents the fans from pulling in heated exhaust air.

1. Open the door to a 90° angle.
2. Push the spring-loaded lever on the upper hinge up and into the notch in the hinge. See Figure 5.
3. Push the spring-loaded lever on the lower hinge down and into the notch in the hinge, supporting the door to prevent it from falling. See Figure 5 for the complete chassis door removal sequence.

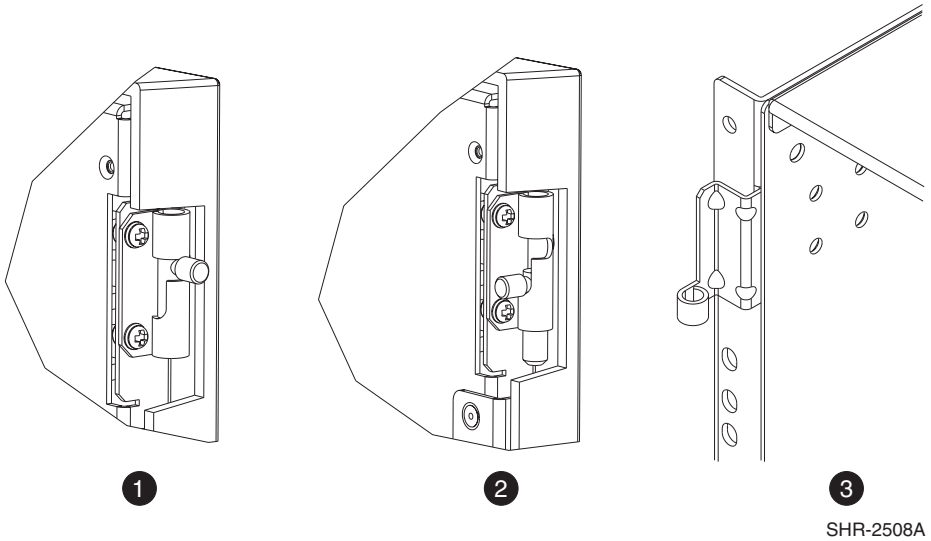


Figure 5: Sequence for detaching the chassis door from the hinges

Note: Put the chassis door aside. You will need to reinstall it after moving the Core Switch 2/64 off the pallet.

4. Position the pallet so that the bottom of the chassis is level with the installation surface.
5. If the chassis is on a pallet jack or lift, stabilize the pallet jack or lift to prevent it from moving during the transfer.

WARNING: A fully populated StorageWorks 14U chassis weighs approximately 250 lbs (113 kg) and requires a minimum of two people to safely slide it from one surface to another.

Installing the Core Switch 2/64 on a Flat Surface

Use these steps to install the Core Switch 2/64 on a flat surface.

Note: The Core Switch 2/64 must be placed on a stable, flat surface, with the blower side of the chassis having access to cool air. Orient the switch so that the port side faces the service aisle.

1. Remove the switch chassis door, if you have not already done so. Removing the Chassis Door, on page 45.
2. Place the Core Switch 2/64 on a flat, sturdy surface like a table or lab bench.
3. Connect the two power cables to the power supply inlets on the switch.

Note: It is recommended to power the switch using two separate power sources, ensuring redundancy.

4. Connect the two power cables to corresponding power outlets. Make sure that the power cable is routed so that it is not exposed to stress.
5. Turn on power to the switch. The switch automatically runs a Power On Self Test (POST).

Note: Do not connect the switch to the network until the IP address is correctly set. For instructions on how to set the IP address, see Configuring Core Switch 2/64 Network Addressing, on page 75 later in this chapter.

6. Reinstall the chassis door as described in the section Reinstalling the Chassis Door, on page 60.

Installing the Core Switch 2/64 in a Rack

Read these sections for specific information on installing the Core Switch 2/64 in a 9000 Series (42U), or comparable rack.

Pre-installation Checklist

Review the following checklist before installing the switch.

- Prepare a site plan. For additional product information, go to: http://www.hp.com/products1/storage/products/san/fibreswitches/coreswitch2_64/index.html.
- Verify that required technical personnel (two technicians) are available and scheduled for the installation.
- Obtain the required fibre-optic cables (multimode or single-mode). Verify cable length and required connectors.
- If applicable, obtain the necessary remote workstations or Simple Network Management Protocol (SNMP) workstations. Workstations are customer-supplied and connected through a corporate or dedicated LAN.
- Verify that the front panel air temperature does not exceed 40 °C (104 °F) during operation.
- Verify that all equipment installed in the rack has a reliable branch circuit ground connection, and does not rely on a connection to a branch circuit, such as a power strip.
- Verify that the rack is balanced.
- Check that the rack is mechanically secured to insure stability in the event of an earthquake.

Items Required for Installation

Locate the following items before beginning the install procedure.

- Lift device—A fully populated Core Switch 2/64 weighs approximately 250 lbs. The switch requires a minimum of two people and a hydraulic or assisted lift to aid in moving the switch from the pallet to its operating location.

- Two power outlets—Identify one power outlet for each of the two power cords. Installing each power cord at two separate sources ensures power supply redundancy.
- Torque driver—Required to secure the 14U Rack Mount Kit hardware to the rack rails.
- Fibre-optic protective plugs—For safety and port transceiver protection, fibre-optic protective plugs must be inserted in all Core Switch 2/64 ports without fibre-optic cables attached. The Core Switch 2/64 ships with protective plugs installed in all ports.
- Standard flat-tip and cross-tip Phillips screwdrivers—Required to remove, replace, adjust or tighten various FRUs, chassis, or rack components.
- Electrostatic discharge (ESD) grounding strap—Required when working in and around the Core Switch 2/64 card cage. Use the ESD strap supplied with the switch.
- Maintenance terminal (desktop or notebook computer)— Required to configure Core Switch 2/64 network addresses and acquire event log information through the serial port. Computer requirements include:
  - Microsoft Windows 98, Windows NT 4.0, Windows 2000, or Windows Millennium Edition operating system installed
  - RS-232 serial communication software (for example, ProComm Plus or HyperTerminal).
- A 9000 Series 42U rack, or any rack with the following specifications,
  - A minimum depth of 29 inches
  - 14 rack units (14U) high
  - 19 inches wide.

Important Rack Mount Guidelines

Review the following rack mount guidelines before proceeding with the installation.

WARNING: A fully populated Core Switch 2/64 weighs approximately 250 lbs and requires a minimum of two people and a hydraulic or assisted lift to install it.

Before installing, verify that the additional weight of the chassis does not exceed the rack's weight limits or unbalance the rack, including when some of the cards or power supplies are partially extended out of the chassis.

- Check that a minimum distance of 28.25 inches is between the front and back rails.
- Verify that the additional weight of the chassis does not exceed the rack's weight limits.
- Check that all equipment installed in the rack is grounded through a reliable branch circuit connection. Do not rely on a secondary connection to a branch circuit, such as a power strip.
- Verify that space is in the rack. The Core Switch 2/64 is 14U, or 24.11 inches high.
- Verify that the rack is stable.
- M5 Tinnermans (0590-2318) and M5 Torx screws (0515-0671) are required pieces of rack mount kit hardware.
- Verify that all other equipment installed in the rack is connected to a reliable ground connection; do not rely on connections to a branch circuit, such as a power strip.
- Plan for cable management before installing the chassis. Cables can be managed in a variety of ways, such as by routing cables below the chassis, to either side of the chassis, through cable channels on the sides of the rack.
- Verify that the Core Switch 2/64 access to a minimum airflow of 350 cubic feet per minute.
- Ensure adequate cooling by installing the chassis with the port side facing the aisle into which exhaust air is released (usually called the "service aisle"). This prevents the fans from pulling in heated exhaust air.

Installing the Core Switch 2/64 in a 9000 Series, 42U Rack

Use the following procedure to install the Core Switch 2/64 in the 9000 Series, or comparable 42U rack using the 14U Rack Mount Kit supplied with the switch. Allow approximately 45 minutes to complete this procedure.

Note: These instructions describe how to install the switch in the bottom area of the rack (section closest to the floor). You may need to orient 14U Rack Mount Kit hardware based on your particular rack's configuration.

Attaching the Rack Mount Shelf Brackets

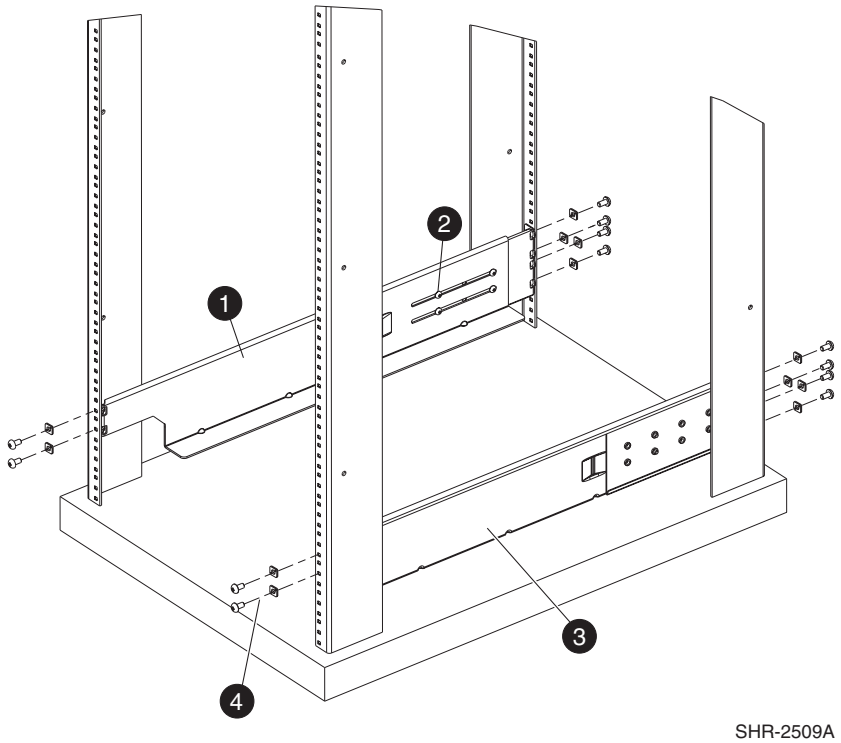
Use these steps to install the rack mount shelf brackets.

Caution: You can install up to two 2/64 switches in the 9000 Series, or comparable 42U rack.

1. If you have not already done so, remove the chassis door. See the "Removing the Chassis Door," instructions listed previously in this chapter.
2. Locate the left and right rack mount shelf brackets. Refer to Figure 4 and Table 5 to identify the hardware.
3. Loosen the adjusting screws on the left and right rack mount shelf brackets, and adjust the length of the brackets according to the depth of the rack. See Figure 6.
4. Locate the small, round marker holes on the rack rails. Each marker hole delineates the beginning of one rail unit, or U. Leave 1U of space free at the bottom of the rack.
5. Count up five square holes from the 1U location. Align the left rack mount shelf brackets with the fifth square hole.
6. Attache rack mount
    a. For rails with round holes; Position the left and right Rack Mount Shelf Brackets with notched portion toward exhaust aisle (see Figure 6) and attach to cabinet rails, using six 1/4-20 x 0.500-inch (1.27 cm) screws with lock washers per bracket (two on the notched end and four on the other end).

b. For rails with square holes, attach the left rack mount shelf bracket to the rack rails using six 1/4-20 x 0.500-inch screws and six square washers. See Figure 6.

Caution: All 14U Rack Mount Kit hardware and screws are supplied with the Core Switch 2/64. Use the exact screws specified in the procedure. Using longer screws may damage the chassis.



❶ Left rack mount shelf bracket
❷ Adjusting screws
❸ Right rack mount shelf bracket
❹ 1/4-20 x .500-inch screws and washers (6)

Figure 6: Installing the left and right rack mount shelf brackets

7. Tighten the screws to a torque of 80-inch pounds.
8. Repeat steps 5 through 7 to install the right rack mount shelf bracket.

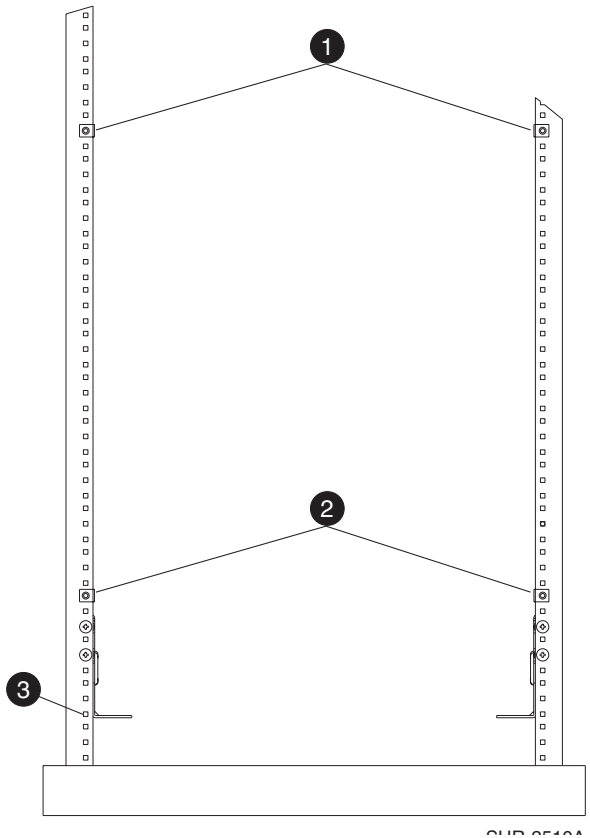
Note: When finished securing the rack mount shelf brackets, remember to tighten the adjustment screws you loosened in step 3, and torque to 32 inch-pounds.

For Rails with Square Holes—Attaching the Retainer Nuts

If installing 14U Rack Mount Kit in rails with square holes (9000 Series, 42U rack), attach retainer nuts to vertical rails on service side of the rack as follows.

Note: Use the retainer nuts for rails with square holes only, (9000 Series, 42U rack). Read the next section, For Rails with Round Holes—Attaching the Clip Nuts, on page 54 if installing switch in rack rails with round holes. Count up 41 square holes from the 1U location.

9. Attach the four retainer nuts to the two rails at the front of the rack (service aisle side). See Figure Figure 7.



❶ Upper retainer nuts, installed in hole #41

❷ Lower retainer nuts, installed in hole #9

❸ 1U location

Figure 7: Installing the retainer nuts on the rails

For Rails with Round Holes—Attaching the Clip Nuts

If installing the 14U Rack Mount Kit in rails with round holes, refer to this section. Attach the clip nuts to the vertical rails on the service side of the rack as follows.

- Use the clip nuts for rails with round holes only.
- Refer to the section For Rails with Square Holes—Attaching the Retainer Nuts, on page 53 if installing the switch in rack rails with square holes.

1. Count up 41 round holes from the 1U location.
2. Attach the four clip nuts to the two rails at the front of the rack (service aisle side). See Figure 7.

Note: Cables can be routed down through the cable management tray or through the holes in the sides of the chassis. If the cables will be routed down through the cable management tray, allow adequate space below the chassis for cable management.

Attaching the Upper Rack Mount Bracket Assemblies to the Chassis

Use these steps to attach the upper rack mount brackets to the chassis. The upper rack mount bracket assemblies consist of the following:

- One right flat upper rack mount bracket attached to an L-shaped bracket
- One left flat upper rack mount bracket attached to an L-shaped bracket

---

Note: To compete this procedure, you must first detach the L-shaped brackets from the upper rack mount bracket assemblies.

---

1. Use a Phillips head screwdriver to remove the screws securing the left and right upper rack mount brackets to the L-shaped brackets. Detach the L-shaped brackets from the assembly, and put them aside.

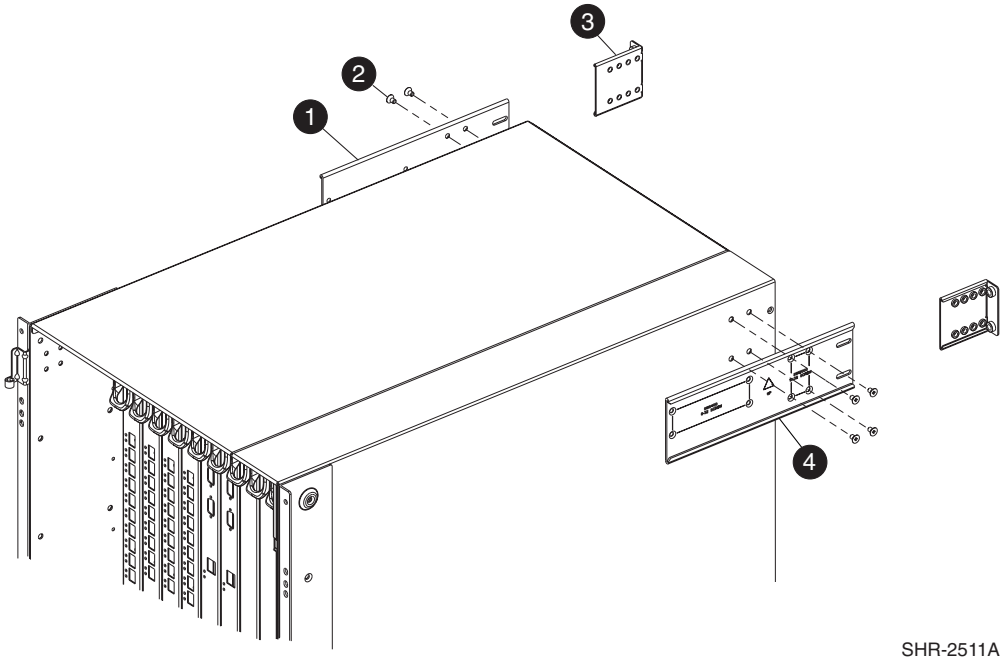
Note: You reinstall the L-shaped brackets to the rack rails in step 5.

---

2. Save the screws for attaching the bracket assemblies to the chassis (see step 1 in the section Securing the Chassis to the Rails on page 58).

3. Use four #10-32 x 5/16 inch screws to secure the right and left flat upper rack mount brackets to the chassis. See Figure 8.

Note: Orient the slotted holes in the brackets toward the blower side of the chassis (see Figure 8 for orientation).

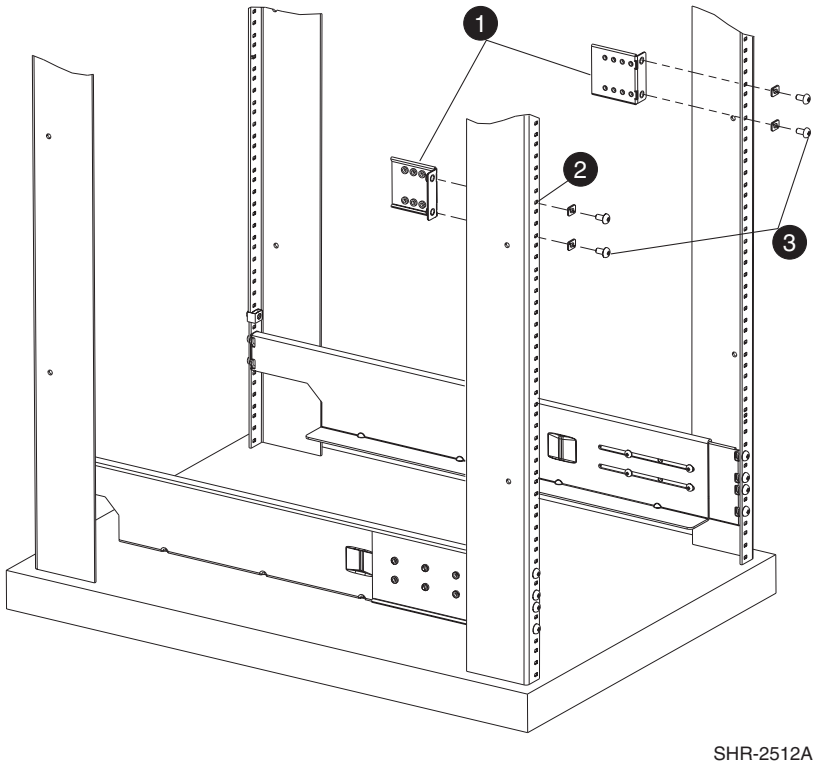


❶ Left flat upper rack mount bracket
❷ #10-32 x 5/16 inch screws (4)
❸ Detached L-shaped brackets (1 of 2)
❹ Right flat upper rack mount bracket

Figure 8: Attaching the left and right flat upper rack mount brackets

4. Tighten the screws, and torque to 32 inch-pounds.

5. Attach the two L-shaped brackets to the rack rails farthest from the service aisle. See Figure 9.
   - — For rails with square holes:
     Attach the two L-shaped brackets to the rack rails, with two of the #1/4-20 x 1/2 inch Phillips panhead screws, and two square washers per bracket. Tighten the screws to a torque of 80 inch-pounds.
   - — For rails with round holes:
     Attach the two L-shaped brackets to the rack rails, using two of the #1/4-20 x 1/2 inch Phillips panhead screws (**Item 8**) per bracket. Tighten the screws to a torque of 80 inch-pounds.
6. Route any cables or cords through the cabinet or along any other route that will be difficult to reach after the chassis is installed. Leave enough cable allowance to plug and unplug cables from switch.



❶ Two L-shaped brackets
❷ Aligning top screw in hole #37
❸ 1/4-20 x 1/2 inch Phillips panhead screws and square washers

Figure 9: Attaching L-shaped brackets to rails

Finalizing the Rack Mount Procedure

Read these sections to install the Core Switch 2/64 into the 9000 Series 42U, or comparable rack.

WARNING: A fully populated SAN Core 2/64 weighs approximately 250 lbs and requires a minimum of two people and a hydraulic or assisted lift to install it.

Before installing, verify that the additional weight of the chassis does not exceed the rack's weight limits or unbalance the rack, including when some of the cards or power supplies are partially extended out of the chassis.

Sliding the Switch into the Rack

1. Before lifting the chassis into the rack, determine an easy access route for cables or cords. Make sure that cables do not get pinned under the weight of the chassis.
2. Position the lift device next to the Core Switch 2/64.
3. Position one technician at the front of the chassis, and the second technician at the rear of the chassis. Carefully move the chassis onto the lift device.
4. Use the lift-assist device to raise the chassis until the bottom of the chassis is level with the shelf-like surfaces of the rack mount shelf brackets.
5. Slide the chassis onto the two rack mount shelf brackets.

Securing the Chassis to the Rails

1. Attach the two flat upper rack mount brackets (that you installed on the chassis earlier) to the two L-shaped brackets installed onto the rack rails. Use the two screws set aside in step 1 of the section Attaching the Upper Rack Mount Bracket Assemblies to the Chassis on page 54. See Figure 10.

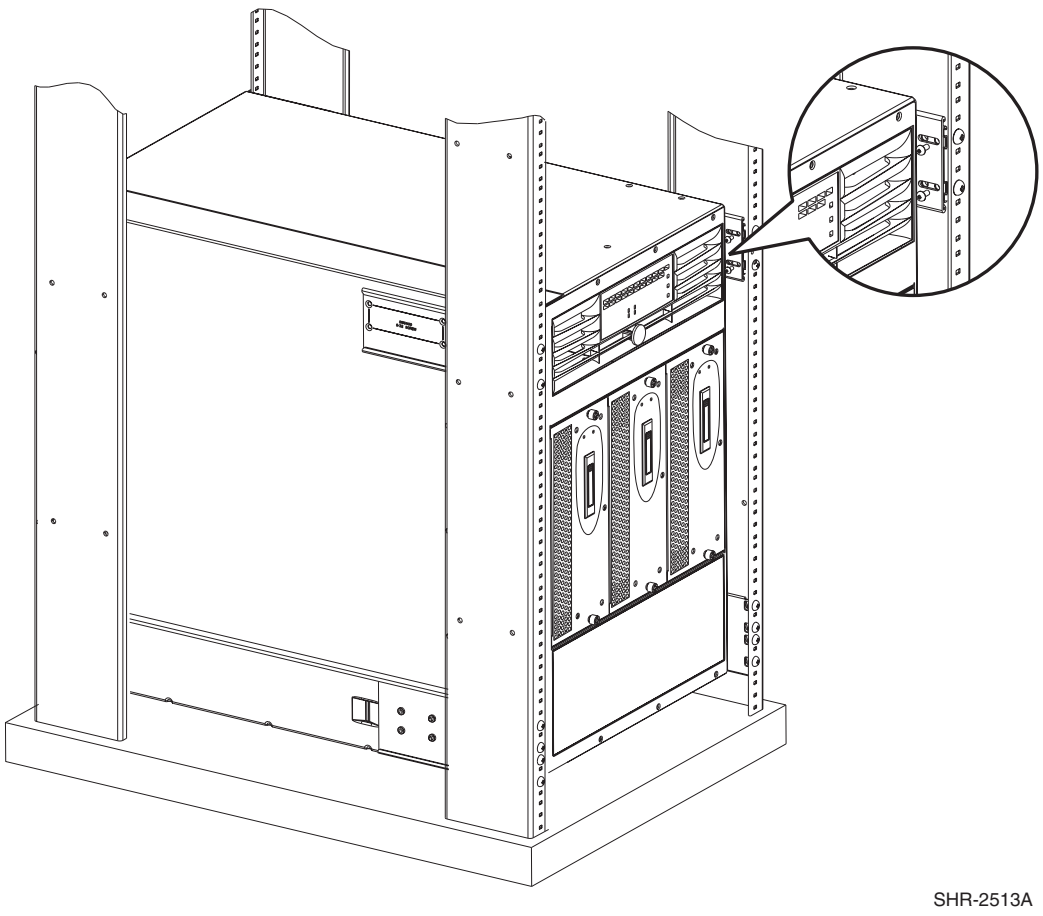
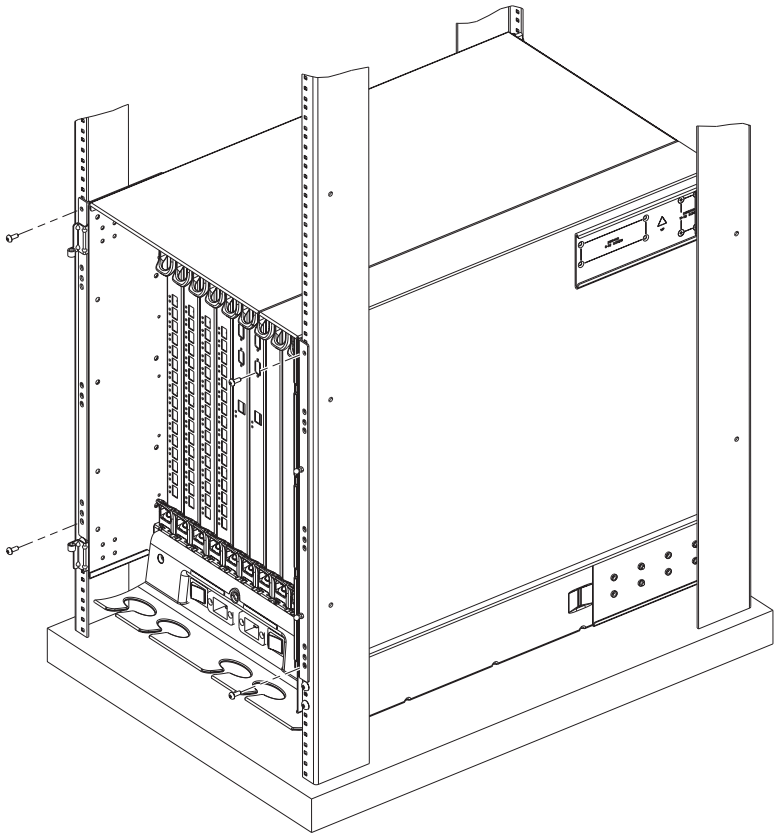


Figure 10: Attaching the upper rack mount bracket to the L-shaped brackets

2. Tighten screws, and torque to 32 inch-pounds.

3. Secure the chassis' port side to the rack rails using two #10-32 x 5/8 inch screws on each side.



SHR-2514A

Figure 11: Securing the chassis port side to rack rails

4. Tighten the screws, and torque to 32 inch-pounds. See Figure 11 for screw locations.

Reinstalling the Chassis Door

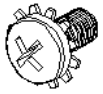
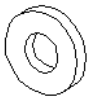
1. Verify that the spring-loaded pins on both door hinges are retracted (push levers into notches).
2. Align the door hinges with the chassis portion of the hinges.
3. Push the levers out of the notches to release the pins.

Caution: Do not connect the switch to the network until the IP addresses are correctly set. Refer to the section Configuring Core Switch 2/64 Network Addressing on page 75.

Installing the Switch in the Optional HP System/e Rack

This section provides instructions for installing the switch in the HP System/e rack. The following hardware is required to install the *optional* HP System/e Rack Mount Kit:

- Rails, rear mounting brackets
- Rail mounting hardware, as listed in the following table:

	(6) #8-32 x 5/16 Phillips pan-head screw with captive star lock washer
	(6) #8 Flat washer
	(6) M5 Torx head screw with captive lock washer
	(2) Rubber washer
	(4) M5 U-type Tinnerman clip

Note: For proper airflow, the SFP media side of the SAN Switch 2/64 must face the rear of the rack. This mounting allows air to enter from the front of the rack and to exhaust at the rear of the rack, similar to other rack-mounted equipment. This prevents switch overheating, which may cause it to fail.

Note: The HP System/e Rack installation procedure in this section provides general guidelines for installing a switch in the rack. Please note that the figures show installation of an edge switch. Installing the Core Switch 2/64 in the HP System/e Rack works similarly.

Use these steps to install the switch in the HP System/e rack.

1. Verify that all required hardware is available.
2. Choose a mounting location in the rack for the switch.
3. Install each of the two mounting brackets with (1) M5 Torx head screw with captive lock washers as shown in Figure 12.

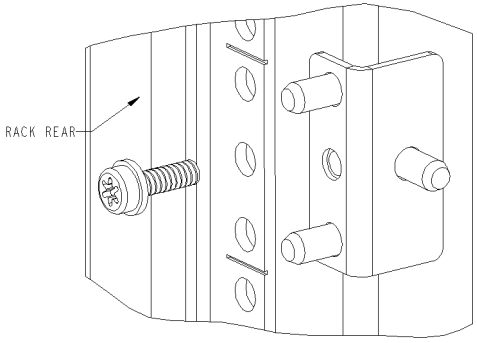


Figure 12: Installing the mounting brackets

4. Install two M5 U-type Tinnerman clips for each of the front columns of the rack in the top and bottom positions of the three-hole pattern as shown in Figure 13.

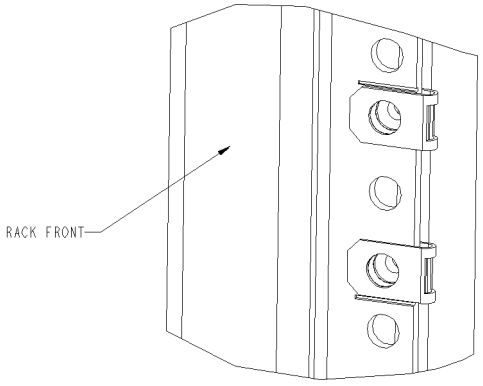
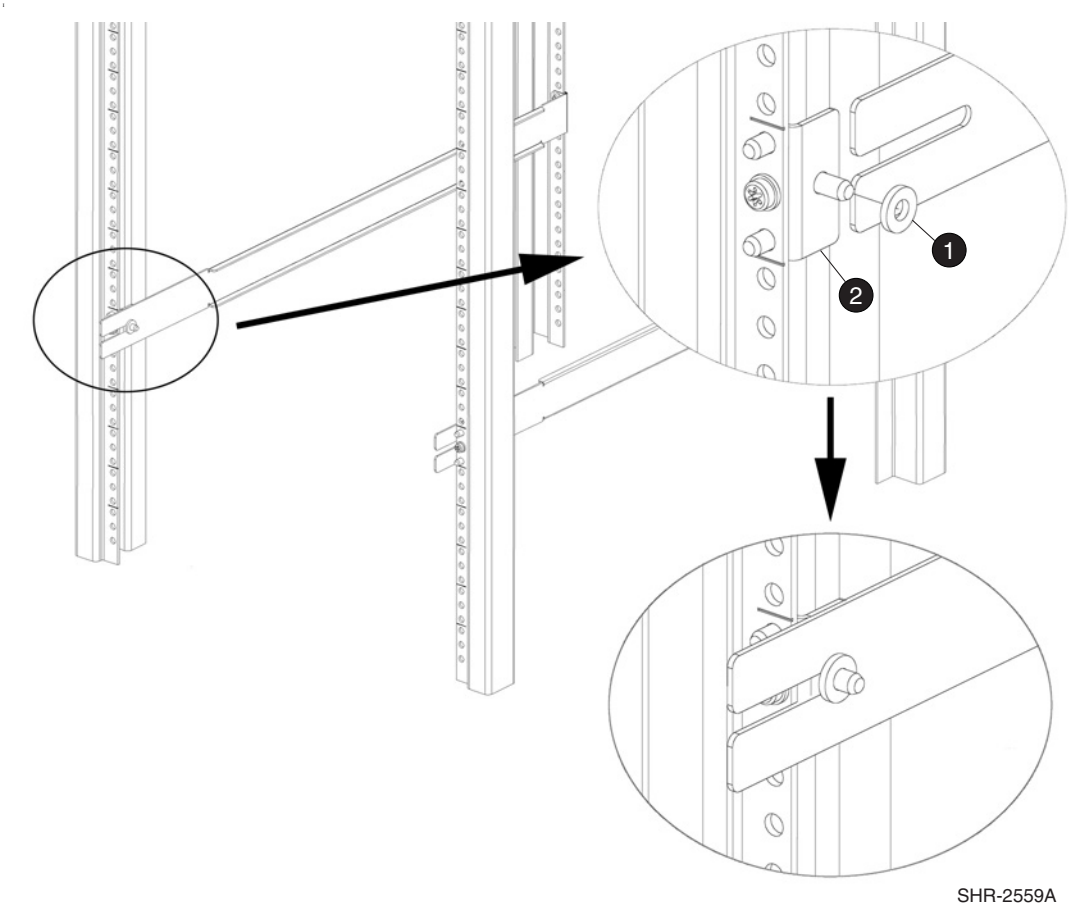


Figure 13: Installing the Tinnerman clips

5. Assemble the outer rails by completing the following steps:
   a. As an aid in assembly, two rubber washers have been included to help keep the rear slotted portion of the outer rail flush against the rear rail-tray brackets. Install them as shown in Figure 14.



❶ Rubber washer (1 of 2)

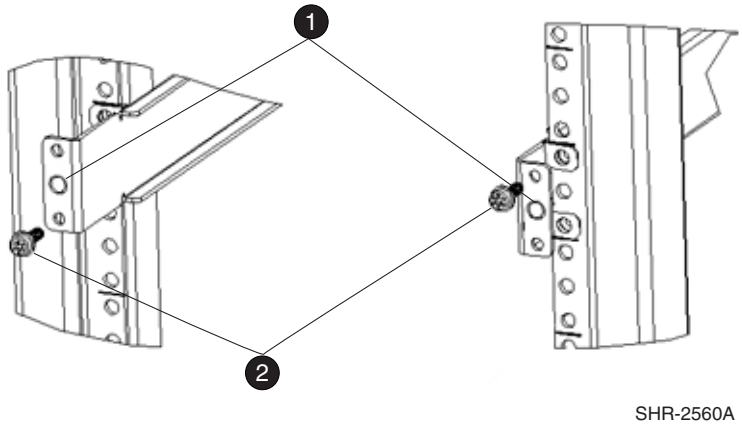
❷ Rear rail tray bracket (1 of 2)

Figure 14: Installing the rubber washers

b. Insert the alignment pins attached to the outer rail front flange into the center opening in the rack.

6. Install one M5 Torx screw in the upper hole location of the right rail. Then, install one M5 Torx screw in the lower location of the left rail. See Figure 15.

Note: Do not install the upper left and the lower right screws until later.



❶ Outer rail alignment pins ❷ M5 torx screws

Figure 15: Assembling the outer rails (HP Rack)

7. Assemble the two inner rails (one on each side) to the switch using (6) #8-32 x 5/16 Phillips pan-head screws, and #8 flat washer as shown in Figure 16.

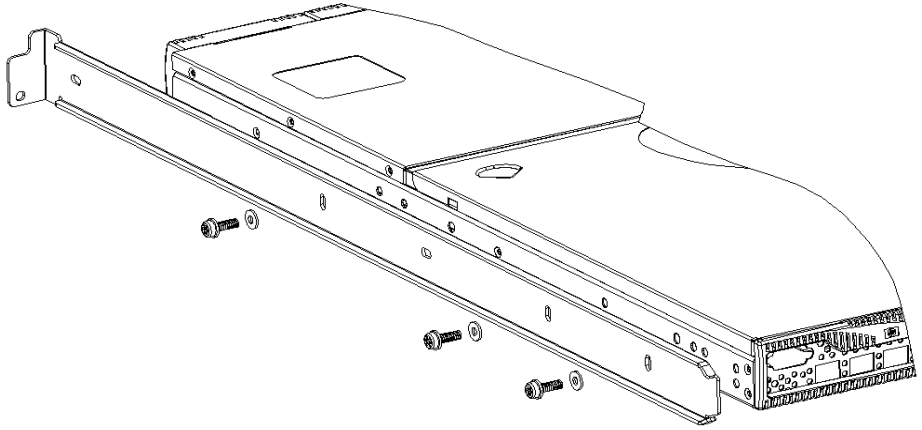


Figure 16: Assembling the inner rails

Note: Figure 16 shows installing the inner rails on a SAN Switch 2/16. The procedure is similar for istalling the inner rails in the Core Switch 2/64.

Caution: Do not use any other screws other than the six that are provided. Use of any longer lengths can cause damage to internal components of the switch. Before tightening screws, make sure that the rails are centered to the overall height of the switch.

8. Insert the switch with the attached inner rails into the outer rails.
9. Install the two remaining M5 Torx screws to complete the installation. See Figure 17.

Note: Figure 17 shows installing the screws on a SAN Switch 2/16. The procedure is similar for istalling the screws in the Core Switch 2/64.

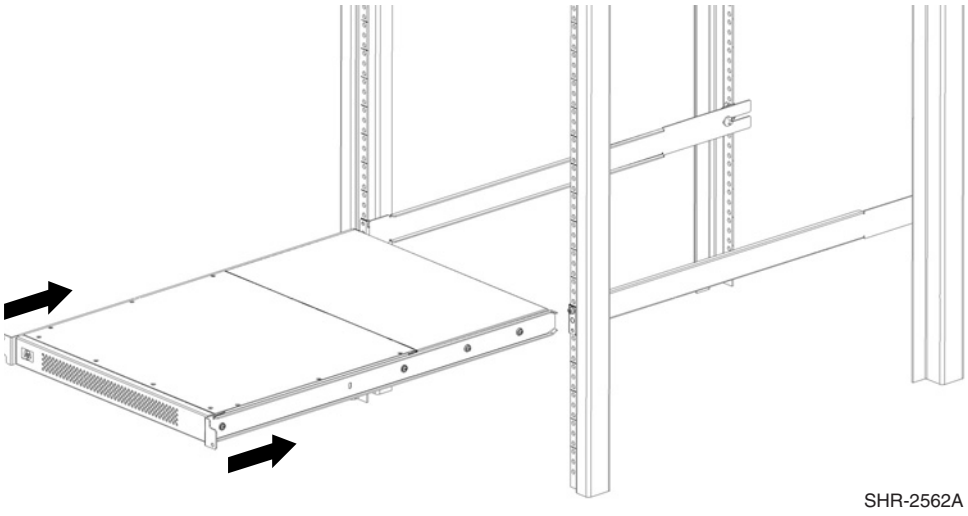


Figure 17: Installing switch into the HP rack

10. See the next section Powering On for the First Time on page 67 for instructions on applying power to the switch.

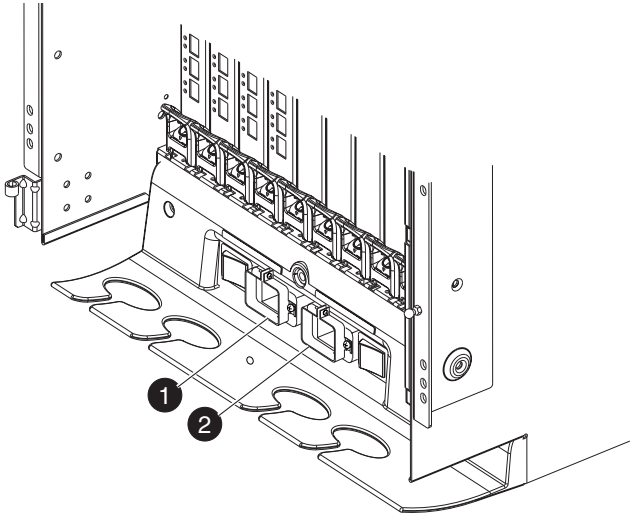
Powering On for the First Time

Use these steps to install the power cord retainers, and apply power to the Core Switch 2/64.

Installing the Power Cord Retainers

HP provides two power cord retainers to hold the AC power cords in place. Phillips screws (#4-40) are included. A #1 Phillips screwdriver is a required tool. Use these steps to attach each power cord retainer onto the AC power inlets.

1. Orient each power retainer as shown in Figure 18.
2. Loosen the adjusting screws on either side of the power inlets to allow the power cord to fit into the retainer.
3. Position the power cord retainer tabs under the two screws on either side of a power connector on the chassis, see Figure 18. The power cords are designed with right and left bends.



❶ Left power cord retainer

❷ Right power cord retainer

SHR-2530A

Figure 18: Installing power cord retainers

4. Tighten both screws.
5. Repeat step 1 through step 4 for the second power cord retainer.

Connecting Power Cords

Use these steps to connect power to the Core Switch 2/64.

1. Connect the power cords to the power connectors on the Core Switch 2/64, inserting them through the power cord retainers. The power cords are designed with right and left bends to facilitate cord management.

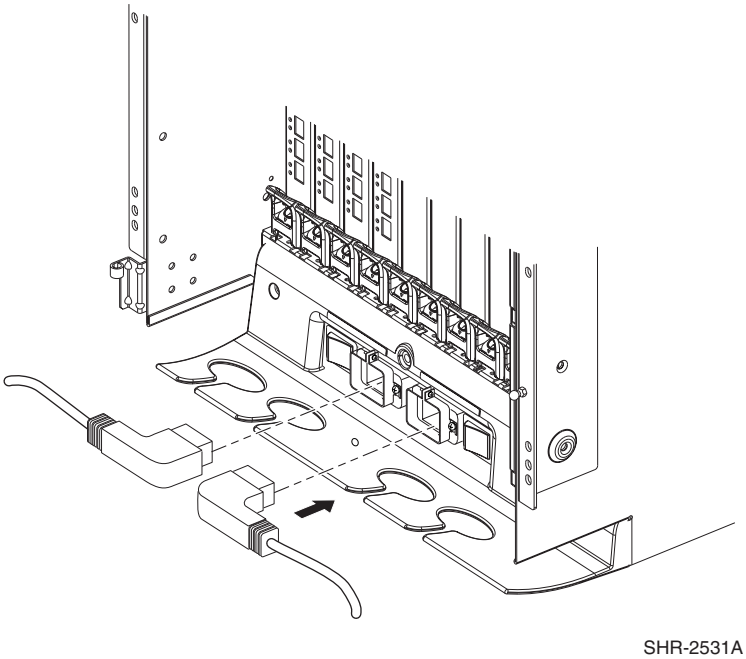


Figure 19: Power cord connections

2. Connect the two AC power cords to a power source with voltage of 200 to 240 VAC, 50-60 Hz.

Note: Installing each power cord using two separate sources ensures power supply redundancy.

---

3. Verify that the power cord has a minimum service loop of 6 inches available at the connection to the switch, and is routed so that it is not exposed to stress.
4. Flip both green AC power switches to **1**. The AC power switch LEDs light green.

Note: Powering off the switch triggers a system reset. When power is restored, all devices are returned to the initial state, and the switch runs POST.

---

5. To turn power off, flip both AC power switches to **0**.

Caution: Allow the Core Switch 2/64 to run for a minimum of 10 minutes after powering on, before powering off again.

The switch automatically runs POST by default each time it is powered on. POST takes a minimum of three minutes, and is complete when indicator light activity returns to a normal state.

Running POST

Each time you power on or reset a switch, the switch automatically performs a system check called POST. The POST cycle takes approximately three minutes to complete. The following occurs during POST:

- Preliminary POST diagnostics
- Operating system initializes
- Hardware initializes
- Internal connections and circuitry diagnostics

In addition, the following switch initialization processes run:

- The switch obtains a domain ID and assigns port addresses
- Unicast routing tables created
- Normal port operation enabled
- Universal port configuration
- Links initialize

Checking POST Results

To verify that POST has completed, and the switch is operating normally:

- Check that all LEDs have returned to a normal state after POST completes (refer to Chapter 3, Interpreting LED Activity, on page 101, for specific LED patterns and their meanings).

  If one or more LEDs do not return to a normal state, (and this is not due to the switch beaconing), use the `slotShow` command to check port status.

- Verify that the switch prompt displays when POST completes. If it does not display, POST was not successfully completed. Contact your switch supplier for support.

- Review the system log. Any errors detected during POST are written to the system log, which is accessible through the `errShow` command.

Core Switch PID Format Summary

A Core PID format is one of several addressing formats used in Fibre Channel. The parameter is used by the routing and zoning services in Fibre Channel fabrics to identify ports in the network.

The PID format is analogous to specifying the physical switch and port a device is attached to in data networks. It is not analogous to an IP address. PIDs are assigned by a Fibre Channel switch when a device logs into the fabric.

The following example shows a sample PID:

```
011F00
```

Many scenarios cause a device to receive a new PID. For example, unplugging the device from one port and plugging it into a different port will cause this. (This might happen when cabling around a bad port, or when moving equipment around.) Another example is changing the domain ID of a switch, which might be necessary when merging fabrics, or changing compatibility mode settings.

Note: All switches running Fabric OS version 4.0.x or higher are shipped with the Core Switch PID Format enabled, so it is not necessary to change the Core Switch PID format on these switches. For example, the HP StorageWorks SAN Switch 2/32 and HP StorageWorks Core Switch 2/64 always use Core Switch PID format 1. This parameter is always 1 and cannot be changed.

Important Information on Checking the Core Switch PID Format

You must update the Core Switch PID Format when upgrading an existing SAN to support larger port-count switches. When a switch with more than 16 ports is introduced into an existing fabric, this parameter needs to be set on all switches in the fabric.

For example, all SAN Switch 2/32 units ship with the Core Switch PID format set to 1. Before connecting to the SAN, you must verify that the Core Switch PID formats of all switches already running in the SAN are also set to 1.

Note: If the Core PID format is set to 0 in switches already running in the SAN, you must follow the procedures in Appendix B, "Updating the Core Switch PID Format" to change the parameter to 1. If the Core Switch PID format is not changed to 1 to match the SAN Switch 2/32's value, then the switches residing in the SAN will fail to communicate with one another.

For detailed recommendations and instructions on updating the Core Switch PID, please refer to Appendix A, Extensive Information on the PID Format, on page 184.

Configuration Overview

The Core Switch 2/64 can contain up to two logical switches, each with its own configuration: one logical switch for any 16-port cards in slots 1-4, and one logical switch for any 16-port cards in slots 7-10.

The configuration information for both logical switches is stored in the WWN card and in the CP cards' flash memory. The configuration settings are automatically mirrored to the standby CP card. In this way, the most current configuration is available even if the active CP card fails.

In addition, you can back up the configuration up by uploading the settings to a workstation using the `configUpload` command, and can be downloaded to the active CP card using the `configDownload` command.

Note: A routine backup of the configuration is recommended, to ensure the current configuration is available if needed. IF the fabric will include switches running version of Fabric OS that are earlier than 4.1, those switches must have the Core PID set to "1" in order to join a fabric with switches running Fabric OS v4.0 or later. For information on setting the Core PID, refer to the *HP StorageWorks Fabric OS Procedures Version 3.1.x/4.1.x User Guide*.

The Core Switch 2/64 configuration can be modified only through a login session to the active CP card. The switch supports up to two simultaneous telnet sessions (with administrative privileges).

Note: For fabric OS v4.1, different logins are provided for each logical switch. Logical Switch 0 has logins User0, Admin0, Factory0, and Root0. Logical Switch 1 has logins User1, Admin1, Factory1, and Root1. For versions earlier than v4.1, the same administrative login account applies to both logical switches. If the password is changed on switch 0, it is automatically changed on switch 1.

Preset Configuration Settings

Caution: Resetting a logical IP address while the switch is running in the fabric may cause Web Tools, Fabric Watch, SNMP, and other applications to terminate.

The Core Switch 2/64 ships with the following factory installed settings:

- General system parameters (modifiable through the `configure` command).
- WWNs for both logical switches: The two WWNs are not modifiable; both are pre-configured and are usually based on the chassis serial number.
- Domain ID: The default domain ID for both logical switches is **1**.
- One domain ID for any 16-port cards in slots 1-4, and one for any 16-port cards in slots 7-10 (domain IDs can be modified through the `configure` command)
- A native IP address, host name, subnet mask, and gateway address for both CP card slots (modifiable through the `ipAddrSet` command).
- Logical IP addresses: A logical IP address and subnet mask for both logical switches (modifiable through the `ipAddrSet` command).
- Switch names for both logical switches (modifiable through the `switchname` command).
- Switch status policies (modifiable through the `switchstatusploicyset` command).
- Core PID setting (modifiable through the `configure` command).

Configuring Core Switch 2/64 Network Addressing

You must configure the Core Switch 2/64 to operate correctly within the network and fabric. The following sections describe network addressing procedures.

Items Required

The following items are required to configure and connect the Core Switch 2/64:

- Core Switch 2/64 powered on but not connected to a network or fabric
- Workstation computer with a terminal emulator application (such as HyperTerminal)
- Serial cable provided with the switch
- Ethernet cable
- SFP transceivers and cables, as required
- Two IP addresses for use as the “native” IP addresses assigned to the CP slots, with the corresponding native host names, subnet masks, and gateway addresses.
  The default native IP addresses and host names are as follows:
  - 10.77.77.75 CP0 (the CP card in slot 5 at the time of configuration)
  - 10.77.77.74 CP1 (the CP card in slot 6 at the time of configuration)
- Two IP addresses for use as the “logical” IP addresses of the switch, with the corresponding subnet masks. These IP addresses correspond to **switch 0**, which contains any 16-port cards in slots 1-4, and **switch 1**, which contains any16-port cards in slots 7-10.
- The default logical IP addresses are as follows:
  - 10.77.77.77 sw0
  - 10.77.77.76 sw1
- Two switch names, if you do not use the default switch names.
  Switch names can be up to 15 characters long, can include alpha, numeric, and underscore characters, and must begin with an alpha character. The default switch name for the logical switches are **sw0** for the switch containing the 16-port cards in slots 1-4, and **sw1** for the switch containing 16-port cards in slots 7-10.

Setting Network Addresses via a Network Connection

Use these steps to set Core Switch 2/64 network addresses.

1. Verify that switch power is on, and POST is complete.

Note: Post is complete when all power LED indicators on the 16-port cards and CP cards display a steady green light. For a description of LED patterns, see Chapter 3, Operating the Core Switch 2/64.

---

2. Log onto the CP card installed in slot 5 by establishing a serial connection to a workstation running a terminal emulator application (such as HyperTerminal on Windows or TERM in a Unix environment).
   a. Disable any serial communication programs running on the workstation (such as synchronization programs for a PDA).
   b. Remove the shipping cap from the terminal serial port on the CP card in slot 5, and insert the serial cable, see Figure 20.

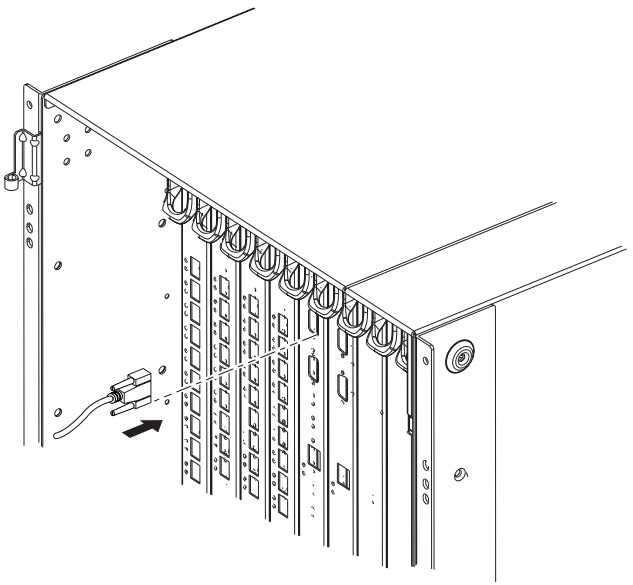


Figure 20: CP card serial port location

c. Connect the other end of the serial cable to a serial port on the workstation.
If necessary, the adapter on the serial cable can be removed to allow for an RJ45 serial connection.

d. Open the terminal emulator application and configure as described in these steps.

— For Windows operating systems, enter the following parameters:

Parameter	Value
Bits per second	9600
Databits	8
Parity	None
Stop bits	1
Flow control	None

— For most UNIX systems, enter the following string at the prompt:

```
tip /dev/ttyb -9600
```

e. When the terminal emulator application stops reporting information, press **Enter** to reach the CP0 Console Login prompt.

f. Enter the administrative logon information. The default administrative logon is `admin` and the default password is `password`.

g. Enter **0** at the login prompt.

Note: At the initial login the user is prompted to enter new Admin and User passwords. The same administrative account applies to both logical switches. If the password is changed on switch 0, it is automatically changed on switch 1.

---

h. Modify passwords if desired. Passwords must be a total of 8 to 40 characters long, and should include a combination of numbers and upper case and lower case letters.

Note: Press **CTRL-C** to skip modifying the password.

---

3. Determine which CP card is active by entering the following command:

   ```
   haShow
   ```

   This command provides the following information:

   ```
   switch:admin> haShow
   Local CP (Slot 5, CP0): Active
   Remote CP (Slot 6, CP1): Standby, Healthy
   HA Enabled, Heartbeat Up, HA State not in sync
   ```

4. Configure the IP addresses for both CP cards, as follows.

Note: Configuration changes can only be made through a session with the active CP card; although you can assign IP addresses to either CP card from a session with the active CP card.

---

   a. If the CP card in slot 5 is not the active CP card, disconnect the serial cable from the CP card, connect it to the CP card in slot 6, and log on as Admin.

   b. Enter the `ipAddrSet` command at the prompt, entering **2** for the CP card in slot 5, and **3** for the active CP card in slot 6. For example:

      ```
      ipAddrSet 2
      ```

   c. Follow the onscreen prompts, and enter the appropriate information, as shown in the following example (the default information for the CP card in slot 5 is shown):

      ```
      switch:admin> haShow
      Ethernet IP Address [10.77.77.75]:
      Ethernet Subnetmask [255.9.9.9]:
      Host Name [CPQ]:
      Gateway Address [0.0.0.0]:
      ```

Note: The host name is the native name assigned to the CP card. The same gateway address must be used for both CP cards (these gateway addresses are referenced for the logical IP addresses).

The native IP address of the active CP card is updated immediately. The native IP address of the standby CP card is updated at the next reboot.

d. Repeat steps 4a through 4c for the remaining CP card.

5. Configure the two logical IP addresses, as follows.

Caution: Resetting a logical IP address while the switch has active IP traffic such as Web Tools, Fabric Watch, SNMP, and other applications, may cause them to terminate.

a. To configure the first logical IP address, enter the following command at the prompt:

```
ipAddrSet 0
```

b. Follow the onscreen prompts, and enter the appropriate addressing information:

```
Ethernet IP Address [10.77.77.77]:
Ethernet Subnetmask [0.0.0.0]:
Fibre Channel IP Address [none]:
Fibre Channel Subnet Mask [none]:
```

The logical IP address is updated immediately.

c. To configure the second logical IP address, enter the following command at the prompt:

```
ipAddrSet 1
```

d. Follow the onscreen prompts, and enter the appropriate addressing information, as described in step 5b.

e. Type `reboot` at the prompt to reboot the CP card.

Note: The terminal serial port can be used to monitor error messages through a serial connection. HP does not recommend using it as a command interface during normal operations because it only modifies one switch at a time (switch 0 by default).

f. When complete, remove the serial cable.

g. Replace the serial port's protective cap.

Connecting the Core Switch 2/64 to the LAN

Use these steps to connect the active CP card to an Ethernet connection.

1. Remove the shipping plug from the Ethernet port on the active CP card.
2. Insert one end of an Ethernet cable into the CP card's Ethernet port.
3. Connect the remaining end to an Ethernet 10/100 Base-T LAN.

Note: The switch can now be accessed by remote connection using any of the available management tools, such as telnet or Web Tools. Ensure that the switch is not modified from other connections during the rest of this procedure. You can complete the remaining steps in this procedure through either the serial session or a telnet session.

---

4. Log on to either of the logical switches by telnet, using the administrative logon. (The default administrative logon name is `admin` and the default password is `password`.)
5. Customize the switch names for the logical switches, as follows.

Note: HP recommends using the default switch names if possible. Changing the switch name causes a domain address RSCN format to be issued.

---

   a. Enter the command `switchName` with the new name in quotes as follows (`sw10` is an example name):

      ```
      switchName "sw10"
      ```

   b. Record the new switch name for future reference.

   c. Customize the switch name for the other logical switch:

      — Logout of the CP session

      — Connect the serial cable to the other CP card

      — Log in as Admin

      — Repeat steps 5a through 5b for the other logical switch.

Modifying Domain IDs

Use these steps to modify the domain IDs, if desired. This is an optional procedure.

1. To view a list of the current domain IDs, open a a telnet session, and type `fabricShow`.

Note: The default domain ID for both switches is "1". To prevent a domain ID conflict, make the domain IDs unique before connecting the switches to the fabric.

---

2. Enter the `switchDisable` command to disable the switch.
3. Enter the `configure` command.
4. Enter **Y** after the **`Fabric parameters`** prompt.
5. Enter a unique domain ID.

   ```
   Domain: (1..239) [1] 3
   ```

6. Follow the remaining onscreen prompts, (or press **CTRL+D** to accept the default settings and exit).
7. Enter the `switchEnable` command to enable the switch.
8. Before connecting the Core Switch 2/64 to the fabric, verify that all the switches in the fabric use the correct PID settings. If the fabric will include switches running versions of Fabric OS that are earlier than 4.1, those switches must have the Core PID set to **1** in order to join a fabric with switches running Fabric OS v4.0 or later. For information on setting the Core PID, refer to the *HP StorageWorks Fabric OS Procedures Version 3.1.x/4.1.x User Guide*.

Specify Custom Status Policies

Use these steps to specify custom status policies, if desired. This is an optional procedure.

1. To access the status policy, enter the following command at the prompt:

   ```
   switchStatusPolicySet
   ```

2. Follow the onscreen prompts to specify the status policies.
3. To completely deactivate the alarm for a particular condition, enter **0** at the prompt for that condition.

Connecting SFPs

Use these steps to connect SFPs (Small Form Factor Pluggable) to the Fibre Channel ports as required. Purchase SFPs separately. For purchasing information, refer to Table 3 in the section Optional Hardware Kits in Chapter 1, on page 30.

Note: The ports are color-coded to indicate which ones can be used in the same trunking groups: four ports marked with black solid ovals alternate with four ports marked with oval outlines.

Note: The ports and cables used in trunking groups must meet specific requirements.

Caution: Do not route cables in front of the exhaust vent (located at the top of the port side of the chassis).

1. Position one of the SFP transceivers so that the key is oriented correctly to the port, and insert the transceiver into the port until it is firmly seated and the latching mechanism clicks. See Figure 21.

Note: Transceivers are keyed so that they can only be inserted with the correct orientation. If the transceiver does not slide in easily, ensure it is correctly oriented. For instructions that are specific to the transceiver model, refer to the transceiver manufacturer's documentation.

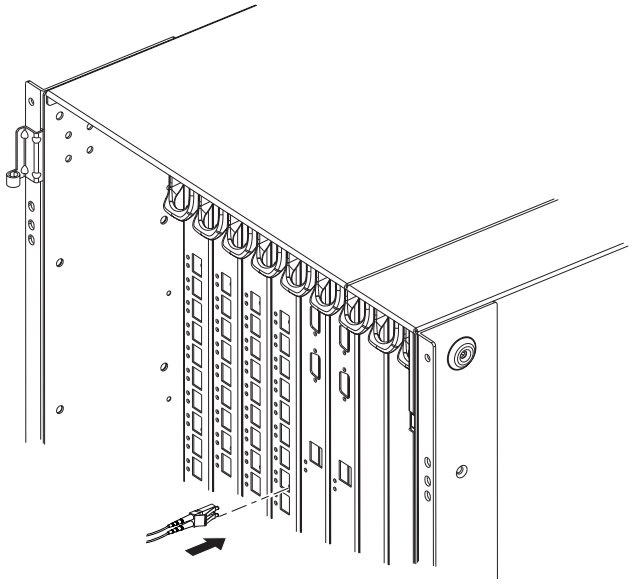


Figure 21: Connecting of a fiber cable

2. Position a cable so that the key (the ridge on one side of the cable connector) aligns with the slot in the transceiver, then insert the cable into the transceiver until the latching mechanism clicks.

   Cables are keyed so that they can only be inserted with the correct orientation. If a cable does not slide in easily, ensure it is correctly oriented.

3. Repeat step 1 and step 2 for the remaining ports.
4. Organize the cables as required.
5. Check port status. Enter the following command at the telnet prompt:

   `switchShow`

   This command provides detailed information about the switch.

6. Check the fabric for ISLs, switch names, or other status by entering the following command at the telnet prompt:

   ```
   fabricShow
   ```

   This command provides general information about the fabric.

7. After all zoning configurations and other changes are complete, back up the configuration. Enter the following command at the telnet prompt:

   ```
   configUpload
   ```

   This command uploads the switch configuration to the server, so that it is available for downloading to a replacement switch if necessary.

Note: A routine backup of the configuration is recommended.

Saving the System Configuration Files

Upload the switch configuration file for disaster recovery and keep it in a safe place where it can be easily found. Backing up the configuration after the initial configuration changes is strongly recommended. A routine backup of the configuration is also recommended to ensure the current configuration is available if needed.

Backing up the Switch Configuration Settings

Use File Transfer Protocol (FTP) on Windows or UNIX workstations to backup the system configuration. The FTP server must be running before an upload can occur.

1. Verify that the FTP service is running on the host workstation.
2. Log in to the switch as the admin user.
3. At the command line enter the following command:

   `configUpload "hostIPaddr", "user", "path_filename","password"`

   The *hostIPaddr* is the IP address of the host computer, *user* is the User ID for this computer, *path_filename* is the path location of the configuration file, and *password* is the password for the user ID specified.

   If you only enter `configUpload`, the system prompts you for each parameter, as shown in the following example:

```
switch:admin> configupload
Server Name or IP Address [host]: 123.45.678.901
User Name [user]: kelev
File Name [config.txt]: switch1
Protocol (RSHD or FTP) [rshd]: ftp
Password:
upload complete
```

Restoring the System Configuration Settings

To restore the system configuration settings from a backup:

1. Verify that the FTP service is running on the host workstation.
2. Log in to the switch as the admin user.
3. Shut down the switch by entering the following command:

   ```
   switchDisable
   ```

4. At the command line enter the following command:

   ```
   configDownload "hostIPaddr", "user", "path_filename","password"
   ```

   The hostIPaddr is the IP address of the host computer, *user* is the User ID for this computer, *path_filename* is the path location of the configuration file, and *password* is the password for the user ID specified.

Note: The password operand is only required if you are using FTP.

---

5. Reboot the switch by entering the following command:

   ```
   fastBoot
   ```

Setting Up Speed Negotiation

There are two methods for configuring the ports on the HP StorageWorks Core Switch 2/64. The port can be set to auto-sensing mode, which allows the port to automatically be configured to the highest speed. Ports can also be set to a fixed speed of either 1 or 2 Gbps.

To display the configuration settings of the ports on a switch, use the `portCfgShow` command. The port speed is displayed as **1G** (fixed speed of 1 Gbps), **2G** (fixed speed of 2 Gbps), or **AN** (auto negotiate). To set the speed level for all the ports on a switch, use the telnet command `switchCfgSpeed`. To set the speed level for a single port, use the `portCfgSpeed` command.

Depending on your environment, you may need to force a port to use a specific speed level because auto negotiation may not be supported by the device. Check the configuration information for your network components for specific requirements.

Operating the Core Switch 2/64

3

This chapter describes how to use the Core Switch 2/64, and includes the following topics:

Powering the Core Switch 2/64 On and Off

Note: To provide power to the switch for the first time, see the section Powering On for the First Time on page 67 in Chapter 2.

To power on the Core Switch 2/64:

1. Verify both power cords are connected to the AC power connectors on the front of the chassis.
2. Flip both green AC power switches to **1**. The green AC power switches illuminate.

Caution: Allow the Core Switch 2/64 to run for a minimum of 10 minutes after powering on to ensure the switch has fully booted before powering off again.

To power off the Core Switch 2/64:

1. Flip both AC power switches to **0**.
2. To remove all sources of power from the switch, disconnect both cables from the power source.

Note: Removing all power from the switch triggers a system reset. When power is restored, all devices are returned to the initial state and the switch runs POST.

Operating Information for System Components

The Core Switch 2/64 includes two logical switches: one for any port cards in slots 1-4, and one for any port cards in slots 7-10. The port cards can be installed in any combination of slots 1-4 (switch 0) and 7-10 (switch 1).

The active CP card controls both logical switches.

Port Cards

Caution: Wear a grounded ESD strap when handling a port card. A grounding connection is available on the chassis above the power connectors.

To ensure correct cooling of the chassis and provide protection from dust, install a filler panel in any slots that do not contain a port card.

Disassembling any part of a port card voids the part warranty and regulatory certifications. There are no user-serviceable parts inside the port card.

Each port card provides 16 auto-sensing Fibre Channel ports, capable of auto-sensing data transmission speeds of 1 and 2 Gbps.

The ports on each of the port cards are color-coded to indicate which ports can be used in the same ISL Trunking group: four ports marked with black solid ovals alternate with four ports marked with oval outlines. An illustration of the Port Card is provided in Figure 22 on page 103.

Note: ISL Trunking is a Fabric OS feature that enables distribution of traffic over the combined bandwidth of up to four ISLs between two directly adjacent switches, while preserving in-order delivery. For more information, refer to the *HP StorageWorks ISL Trunking Version 3.1.x/4.1.x User Guide*.

The switch can continue to operate while a port card is being replaced, but any devices connected to the port card must be disconnected. To ensure correct air circulation inside the switch and provide protection from dust, filler panels can be ordered for any empty slots.

To determine the status of a port card:

1. Check the LED indicators on the port card. For information about how to interpret the LED patterns, refer to Table 9 on page 104.
2. Check port card status using the `slotshow` command.
   For additional information about this command, refer to the *HP StorageWorks Fabric OS Version 3.1.x/4.1.x Reference Guide*.

Control Processor Cards

Caution: Wear a grounded ESD strap when handling a CP card. A grounding connection is available on the chassis above the power connectors.

To ensure correct cooling of the chassis and provide protection from dust, install a filler panel in any slots that do not contain a CP card.

Disassembling any part of a CP card voids the part warranty and regulatory certifications. There are no user-serviceable parts inside the CP card.

About the CP Card

High availability is provided through redundant CP cards. One CP card acts as the active CP card, actively controlling the Core Switch 2/64. The other acts as standby in case rapid failover is required. Failover occurs as soon as the active CP card is detected to be faulty or uninstalled. If the active CP card fails or is uninstalled, the standby CP card automatically becomes the new active CP card. The configuration is mirrored to the standby CP, so that if failover occurs, the current configuration is still available.

Information about both CP cards, including which card is active, is available through the `hashow` command. For information about commands and whether they can be entered through the active or standby CP card, refer to the *HP StorageWorks Fabric OS Version 3.1.x/4.1.x Reference Guide*.

The switch can continue to operate while a CP card is being replaced. To ensure correct air circulation inside the switch and protection from dust, filler panels can be ordered for any empty slots. An illustration of the CP Card is provided in Figure 23 on page 107.

Available Ports

Each CP card provides the following ports:

- Modem serial port (labeled RS-232)—The modem serial port has an RS-232 connector wired as a DTE device, and is designed to connect to a DCE device, such as a modem.
- Terminal serial port (also known as a console port; labeled 10101)—The terminal serial port has an RS-232 signal subset connector that can be used to connect to a PC serial port or dumb terminal.
- Ethernet port—The ethernet port has an RJ-45 connector, and is capable of speeds of 10/100 Mbps.

Modem Connection

A separate modem can be connected to each modem serial port, and then connected to the same or separate telephone lines for redundancy. For modem installation instructions, see Appendix D, Setting Up and Configuring Modems.

Note: The Core Switch 2/64 only detects modems during power on or reboot. If a modem is connected to an operating switch, the Core Switch 2/64 must be rebooted in order to detect the modem.

Services Controlled by the CP Card

The active CP card controls the following services:

- System initialization
- High availability and switch drivers
- Name server
- SNMP
- Fabric OS
- Extended Fabrics
- Fabric Watch
- Remote Switch
- Web Tools
- Zoning
- Secure Fabric OS
- Performance Monitoring

Determining the Status of the CP Card

To determine the status of a CP card:

- Check the LED indicators on the CP card. For information about how to interpret the LED patterns, refer to Table 10 on page 108.
- Check CP card status using the `slotshow` and `hashow` commands.For additional information about these commands, refer to the *HP StorageWorks Fabric OS Version 3.1.x/4.1.x Reference Guide*.

Power Supplies

The Core Switch 2/64 uses up to four power supplies, with a minimum of two required to power a completely loaded chassis. The left power connector provides power to the power supplies in slots #1 and #3 (color-coded blue), and the right power connector provides power to the power supplies in slots #2 and #4 (color-coded yellow).

The Core Switch 2/64 can continue operating while a power supply is replaced if at least one power supply continues operating for every four port cards installed. A minimum of two power supplies are recommended.

Caution: To protect against AC failure, a minimum of one power supply in slot #1 or slot #3 and one in slot #2 or #4 is recommended. If only two power supplies are installed and they are both installed in slots corresponding to the same power cable, an accidental unplugging of that power cable will power down the entire chassis. Color coding indicates which AC switches and connectors correspond to which power supplies.

Before replacing a power supply, determine whether adequate power to keep the chassis operating will be available throughout the replacement. If not, shut down both switches before continuing (see Replacing the Power Supply or Filler Panel on page 149). If adequate power is abruptly lost such as through removal of a power supply, the entire switch is powered down; the power off order designated by `powerOffListSet` is not followed.

Disassembling any part of the power supply voids the part warranty and regulatory certifications. There are no user-serviceable parts inside the power supply.

To determine the status of a power supply:

1. Check the LED indicators on the power supply. For information about how to interpret the LED patterns, refer to Table 11 on page 111.
2. Check power supply status using the `psshow` command. The power supply status displays OK, absent, faulty. If a power supply is absent or faulty, contact the switch supplier to order replacement parts, as necessary. For additional information about the `psshow` command, refer to the *HP StorageWorks Fabric OS Version 3.1.x/4.1.x Reference Guide*.

AC Power Input Connectors and AC Power Switches

The Core Switch 2/64 has two AC power input connectors, each with a green AC rocker switch. The left power input connector provides power to the power supplies in slots #1 and #3, and the right power input connector provides power to the power supplies in slots #2 and #4. The power input connectors and their associated power supplies are color-coded.

Caution: Unplugging a single power cable can power down the entire switch, depending on which power supply slots contain power supplies.

Two detachable power cords are provided with the system and are customized for the country in which the system is installed. The AC power switches light up green when on.

Blower Assemblies

The switch is cooled by three blower assemblies located in the back of the chassis. The air enters through the vents in the blower assembly side of the chassis and exits from the top vent on the port side of the chassis. The chassis requires a minimum air flow of 350 cubic feet per minute (595 cubic meters per hour).

The blower assemblies are hot-swappable, although two blower assemblies must remain operating at all times. If more than one blower assembly must be removed at the same time, power off the Core Switch 2/64 to prevent overheating.

WARNING: The Core Switch 2/64 requires a minimum of two functioning blower assemblies during operation. To ensure continuous adequate cooling, maintain three operating blower assemblies at all times except for the brief period when replacing a blower assembly.

The Core Switch 2/64 port cards automatically shut down if the internal temperature range is exceeded.

Caution: Disassembling any part of the blower assembly voids the part warranty and regulatory certifications. There are no user-serviceable parts inside the blower assembly.

To determine the status of a blower assembly:

1. Check the LED indicators on the blower assembly. For information about how to interpret the LED patterns, refer to Table 12 on page 113.
2. Check the blower assembly status by entering the `fanshow` command. The status for each blower assembly displays OK, absent, or faulty. If any of the blower assemblies are absent or faulty, contact the switch supplier to order replacement parts, as necessary. For additional information about the `fanshow` command, refer to the *HP StorageWorks Fabric OS Version 3.1.x/4.1.x Reference Guide*.

WWN Card and Bezel

The WWN card and bezel are located at the top of the blower assembly side of the chassis. The WWN card and bezel provide LEDs for monitoring the switch from the blower assembly side of the chassis. The WWN card also stores the following information:

- The chassis serial number (used when installing software licenses)
- The two IP addresses assigned to the CP card slots
- Information for the two logical switches in the Core Switch 2/64:
  - The logical switch names
  - The logical IP addresses
  - The logical WWNs

The bezel protects the card and identifies each of the LEDs on the WWN card. Together, the WWN card and bezel assembly provide a consolidated view of the LEDs for the two CP cards, eight port cards, and four power supplies. If a slot contains a filler panel, the corresponding LEDs on the WWN card are not illuminated.

Note: There are two possible versions of the WWN card; one is attached to the chassis by screws, and the other version is held on by the pressure of the bezel against a pad on the card face.

Caution: If the WWN card fails, follow the instructions provided with the replacement card. Wear a grounded ESD strap when handling the card (a grounding connection is available on the chassis above the power connectors). Do **not** reboot the switch while the WWN card is uninstalled, as this can cause the switch to boot incorrectly.

Managing Cables

Two items are provided to assist with cable management:

- Cable Management Tray —The Cable Management Tray is attached to the bottom of the chassis, and can be used to route the power cables and other cables down below the chassis or out the sides of the chassis.
- Cable Guides—A set of 16 cable guides are provided with the Core Switch 2/64, and can be used to organize the port cables into logical groups, such as according to port quads (sets of four neighboring ports). The cable guides are free-floating and do not attach to the chassis.
  The cable guides serve to keep the cables evenly spaced and to hold them away from the port cards to make card replacement easier and to prevent the cables from bending to less than the minimum bend radius.

Caution: Do not route the cables in front of the air exhaust vent, which is located at the top of the port side of the chassis.

The minimum bend radius for a 50-micron cable is 2 inches under full tensile load, and 1.2 inches with no tensile load.

Tie wraps are not recommended for optical cables because they are easily overtightened.

Reviewing Default Configuration Settings

Read the following sections for default configuration settings.

Core Switch 2/64 Switch Settings

Table 6 lists Core Switch 2/64 default configuration settings.

Table 6: Core Switch 2/64 Default Parameters

Parameter	Default
Switch Name for Logical Switch 0	Core Switch
Base IP Address for Logical Switch 0	10.77.77.77
Logical Switch 0 and 1 Subnet Mask	255.255.255.0
CP card 0 and 1 Subnet Mask	255.255.255.0
Ethernet Link Mode	Auto
CLI Timeout	15 Minutes

Default Fabric Parameters

Table 7 lists Core Switch 2/64 default fabric parameters.

Table 7: Default Fabric Parameters

Parameter	Default
Domain	1
BB_Credit	16
R_A_TOV	10,000
E_D_TOV	2000
WAN_TOV	0
MAX_HOPS	7
WAN_RTT_DLY_MAX	200
Data Field Size	2112
Sequence Level Switching	0
Disable Device Probing	1
Suppress Class F Traffic	0

Table 7: Default Fabric Parameters (Continued)

Parameter	Default
SYNC IO Mode	0
VC Encoded Address Mode	0
Core Switch PID Format	1
Per-Frame Route Priorities	0
Long Distance Fabric	0

Default Virtual Channel Settings

Table 8 lists Core Switch 2/64 default virtual channel settings.

Table 8: Virtual Channel Settings

Parameter	Default
VC Priority 2	2
VC Priority 3	2
VC Priority 4	2
VC Priority 5	2
VC Priority 6	3
VC Priority 7	3

Interpreting LED Activity

System activity and status can be determined through the activity of the LED indicators on the switch. There are three possible LED states:

- No light
- Steady light, in one of the following colors:
  - Green
  - Orange (also referred to as amber in related documentation)
  - Yellow (appears when both green and orange LED elements are lit)
- Flashing light (green, orange, or yellow)

The LEDs may flash green, yellow, or orange while the switch is booting or while POST or other diagnostic tests are running. This is normal, and does not indicate a problem unless the LEDs do not indicate that all components are operational after boot process, POST, and any diagnostic tests are complete.

System Components

The HP StorageWorks Core Switch 2/64 can contain up to two logical switches, each with its own configuration: one for any 16-port cards in slots 1-4 and one for any 16-port cards in slots 7-10. The 16-port cards can be installed in any combination of slots 1-4 (“switch 0”) and 7-10 (“switch 1”), with one exception: if there are one or more 16-port cards in slots 7-10, there must be at least one 16-port card in slots 1-4.

The active CP card controls both logical switches.

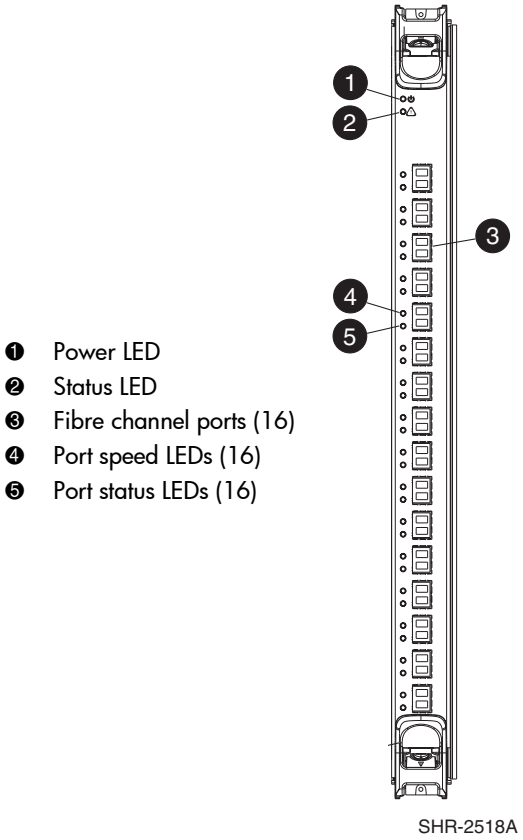
Each 16-port card provides 16 auto-sensing Fibre Channel ports, capable of auto-sensing data transmission speeds of 1 and 2 Gbps.

The ports on each of the 16-port cards are color-coded to indicate which ports can be used in the same ISL Trunking group: four ports marked with black solid ovals alternate with four ports marked with oval outlines.

16-Port Card LEDs

The 16-Port card includes a power LED and a status LED. In addition, each of the 16 ports has two LEDs to the left of the port, a port status LED and a port speed LED. See Figure 22 on page 103 and Table 9 on page 104.

Note: The LEDs patterns may temporarily change during POST and other diagnostic tests.



❶ Power LED
❷ Status LED
❸ Fibre channel ports (16)
❹ Port speed LEDs (16)
❺ Port status LEDs (16)

Figure 22: 16-port card LEDs

Table 9: 16-Port Card LED Patterns

Location of LED on Card	Purpose of LED	Color of LED	Status of Hardware	Recommended Action
Top LED 	Power	No light (LED is off)	16-port card does not have incoming power.	Ensure card is firmly seated and has power.
		Steady green	16-port card has incoming power.	No action required.
Second LED 	Status	No light (LED is off)	16-port card is either healthy or does not have power.	Verify Power LED is lit.
		Steady yellow	16-port card is faulty.	Ensure card is firmly seated, and check status with `slotShow` command. If LED is still yellow, consult switch supplier.
		Slow-flashing yellow (on 2 second; off 2 second)	16-port card is not seated correctly, or is faulty.	If light continues to flash, pull card out and reseat. If LED continues to flash, replace card.
		Fast-flashing yellow (on 1/2 second; off 1/2 second)	Environmental range exceeded, per Fabric Watch preset parameters.	Check for out-of-bounds environmental condition.
Left of each port, upper LED	Port Speed	No light (LED is off)	Port is either set to 1 Gbps mode, or does not have incoming power.	Verify Power LED is lit.
		Steady green	Port is set to 2 Gbps mode.	No action required.

Table 9: 16-Port Card LED Patterns (Continued)

Location of LED on Card	Purpose of LED	Color of LED	Status of Hardware	Recommended Action
Left of each port, lower LED	Port Status and Activity	No light (LED is off)	Either the 16-port card does not have incoming power or there is no light or signal carrier detected.	Verify that Power LED is lit, and check transceiver and cable.
		Steady green	Port is online (connected to an external device) but has no traffic.	No action required.
		Slow-flashing green (on 1 second; off 1 second)	Port is online but segmented, indicating a loop back plug or cable, or an incompatible switch.	Verify correct device is connected to port.
		Fast-flashing green (on 1/4 second; off 1/4 second)	Port is in internal loop back (diagnostic).	No action required.
		Flickering green	Port is online, with traffic flowing through port.	No action required.
Left of each port, lower LED, (cont'd)	Port Status and Activity	Steady yellow	Port is receiving light or signal carrier, but is not yet online.	No action required.

Table 9: 16-Port Card LED Patterns (Continued)

Location of LED on Card	Purpose of LED	Color of LED	Status of Hardware	Recommended Action
		Slow-flashing yellow (on 2 seconds; off 2 seconds)	Port is disabled (diagnostic tests or `portDisable` command).	Reset port from workstation.
		Fast-flashing yellow (on 1/2 second; off 1/2 second)	Transceiver or port is faulty.	Change transceiver or reset switch from workstation.
		Alternating green and yellow	Port is bypassed.	Reset port from workstation.

CP Card LEDs

The Control Processor card contains four LEDs: a CP card power LED, a CP card status LED, a link status and activity LED, and a link speed LED. See Figure 23 on page 107 and Table 10 on page 108.

Note: The LED patterns may temporarily change during POST and other diagnostic tests.

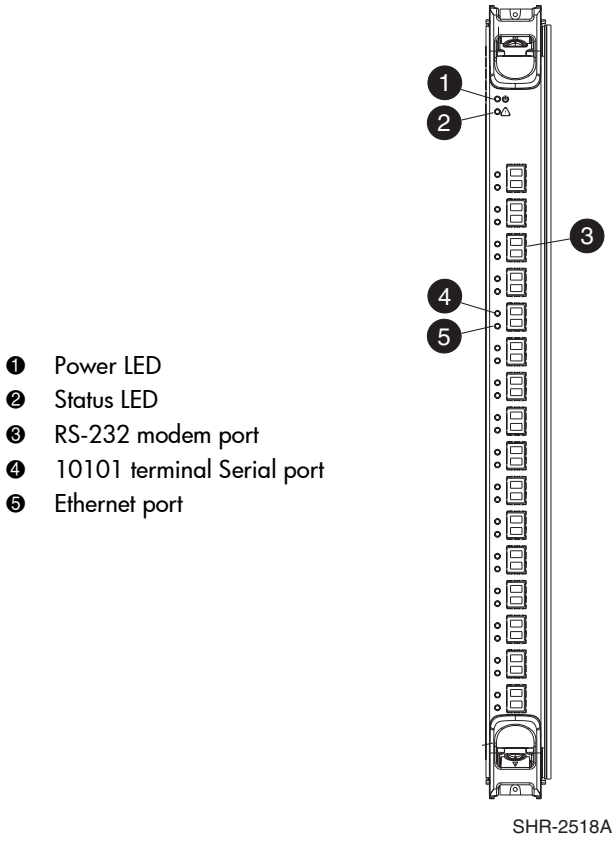


Figure 23: CP card LEDs

There are two CP cards, an active CP card and a standby CP card. The active CP card is the one actively controlling the HP StorageWorks Core Switch 2/64. If the active CP card fails or is uninstalled, the standby CP card automatically becomes the new active CP card. Failover occurs as soon as the active CP card is detected to be faulty or uninstalled.

Each CP card provides the following ports:

- Modem serial port
- The modem serial port has an RS-232 connector wired as a DTE device and is designed to connect to a DCE device, such as a modem.

- Terminal serial port (also known as a console port)
- The terminal serial port has an RS-232 signal subset connector that can be used to connect to a PC serial port or dumb terminal.
- Ethernet port - The Ethernet port has an RJ-45 connector and is capable of speeds of 10/100 Mbps.

Table 10: Control Processor Card LED Patterns

Location of LED	Purpose of LED	Color of LED	Status of Hardware	Recommended Action
Top LED ⏻	Power	No light (LED is off)	CP card does not have incoming power.	Ensure CP card is firmly seated and has power.
		Steady green	CP card has incoming power.	No action required.
Second LED ⚠	Status	No light (LED is off)	CP card is either healthy or does not have incoming power.	Verify Power LED is lit.
		Steady yellow	CP card is faulty.	Ensure CP card is firmly seated. If LED is still yellow, consult switch supplier.
		Slow-flashing yellow (on 2 second; off 2 second)	CP card is not seated correctly or is faulty.	Pull unit out and reseat. If LED continues to flash, replace unit.
		Fast-flashing yellow (on 1/2 second; off 1/2 second)	Environmental range exceeded.	Check for out-of-bounds environmental condition.

Table 10: Control Processor Card LED Patterns (Continued)

Location of LED	Purpose of LED	Color of LED	Status of Hardware	Recommended Action
Link LED	Link Status and Activity	No light (LED is off)	Either CP card does not have incoming power or no link is detected.	Ensure CP card has power, and verify Ethernet cable is firmly seated and device at other end of link is functioning.
		Flickering green and yellow	Link is healthy, with traffic flowing through port.	No action required.
10/100 Mb/s LED	Link Speed	No light (LED is off)	Either link speed is 10 Mb/s or CP card does not have incoming power.	Ensure CP card has power.
		Steady green	Link speed is 100 Mb/s.	No action required.

Power Supply LEDs

The HP StorageWorks Core Switch 2/64 uses up to four power supplies with a minimum of two required to power a completely loaded chassis. The left power connector provides power to the power supplies in slots #1 and #3 (color-coded blue), and the right power connector provides power to the power supplies in slots #2 and #4 (color-coded yellow).

The HP StorageWorks Core Switch 2/64 can continue operating while a power supply is replaced if at least one power supply continues operating for every four 16-port cards installed. HP recommends a minimum of two power supplies.

Figure 24 shows the principle parts of the power supply, including the three LED indicators. See Table for a complete description of LEDs and their meanings.

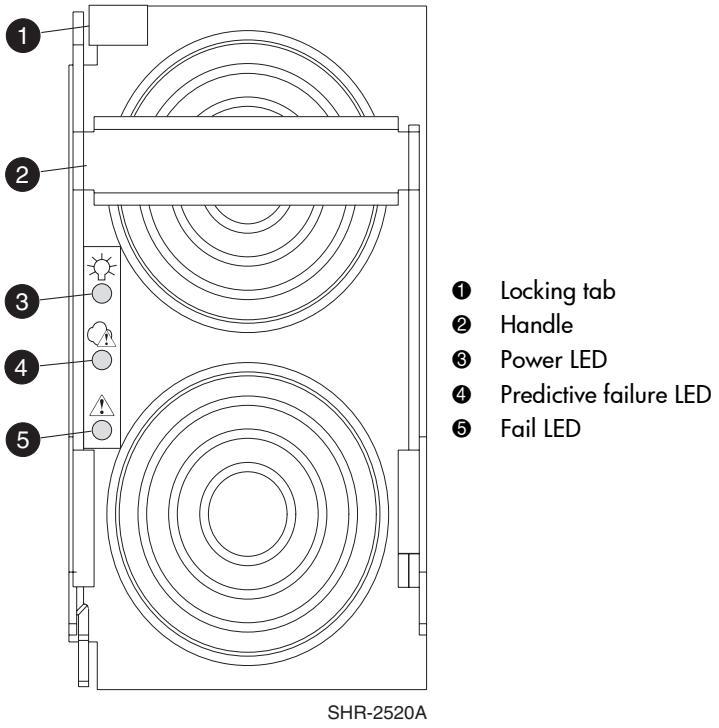


Figure 24: Power supply LEDs

If only one AC power switch is turned on, the fail LED on each of the two power supplies without power will light.

Note: The LEDs patterns may temporarily change during POST and other diagnostic tests.

Table 11: Power Supply LED Patterns

Location of LED	Purpose of LED	Color of LED	Status of Hardware	Recommended Action
Upper LED 	Power	No light (LED is off)	Power supply does not have incoming power and is not providing power to switch.	Ensure Power Supply is firmly seated, switch has incoming power, both power cables are connected, and AC power switches are on.
		Steady green	Power has incoming power and is providing power to switch.	No action required.
Center LED 	Predictive Failure	No light (LED is off)	Power supply is either healthy or does not have incoming power.	Check Power LED.
		Flashing orange (amber)	Power supply is about to fail due to a failing fan inside the Power Supply.	Replace Power Supply.

Table 11: Power Supply LED Patterns (Continued)

Location of LED	Purpose of LED	Color of LED	Status of Hardware	Recommended Action
Lower LED 	Fail	No light (LED is off)	Power supply is either healthy or does not have incoming power.	Check Power LED.
		Steady orange (amber)	Either the switch has power but this Power Supply does not (AC switch may be off), or the Power Supply has failed.	Ensure correct AC power switch is on and Power Supply is seated. If orange light continues, replace Power Supply.
		Flashing orange (amber)	Power supply is unable to supply power.	Verify incoming power meets requirements listed in Appendix A.

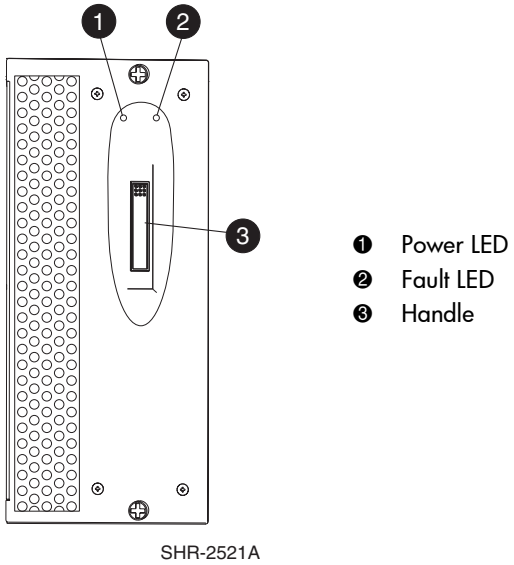
Blower Assemblies LEDs

The switch is cooled by three blower assemblies located on the blower assembly side of the chassis. The air enters through the vents on the blower assembly side of the chassis and exits from the vent in the top of the port side of the chassis. The chassis requires a minimum airflow of 350 cubic feet per minute. This requires a minimum of two blower assemblies operating at all times.

The blower assemblies are hot-swappable. If more than one blower assembly must be removed at the same time, turn off the switch to prevent overheating.

Each blower assembly contains a power LED and a fault LED, see Figure 25. Table 12 is a list of blower assembly LED Patterns, and their meanings.

Note: The LEDs patterns may temporarily change during POST and other diagnostic tests.



❶ Power LED
❷ Fault LED
❸ Handle

Figure 25: Blower assembly LEDs

Table 12: Blower Assembly LED Patterns

Location of LED	Purpose of LED	Color of LED	Status of Hardware	Recommended Action
Left LED ⏻	Power	No light (LED is off)	Blower assembly does not have incoming power.	Ensure blower assembly is firmly seated and powered.
		Steady green	Blower Assembly has incoming power.	No action required.

Table 12: Blower Assembly LED Patterns (Continued)

Location of LED	Purpose of LED	Color of LED	Status of Hardware	Recommended Action
Right LED 	Fault	No light (LED is off)	Blower assembly does not have incoming power.	Ensure blower assembly has incoming power.
		Steady orange	Blower assembly has fully or partly failed.	Replace blower assembly.
		Slow-flashing orange (on 2 second; off 2 second)	Blower assembly is not seated correctly or is faulty.	Pull unit out and reseat. If LED continues to flash, replace unit.
		Fast-flashing orange (on 1/2 second; off 1/2 second)	Environmental range exceeded.	Check for out-of-bounds environmental condition.

WWN Card LEDs

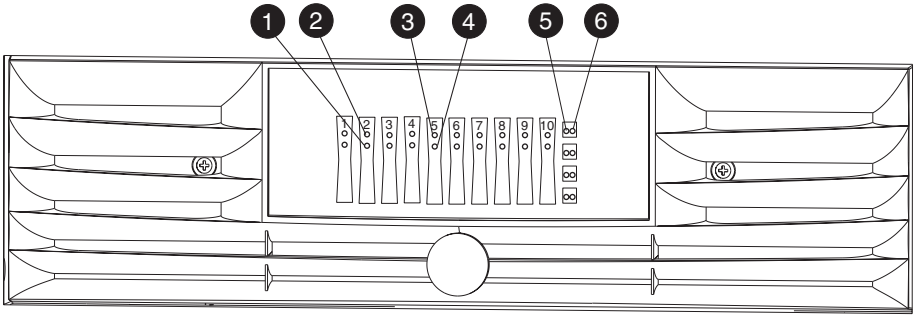
The WWN card and bezel are located at the top of the blower assembly side of the chassis. The card and bezel provide a consolidated LED view of (see Figure 26 on page 115):

- Incoming power to and status of the 16-Port Cards in slots 1-4 and 7-10;
- Incoming power to and status of the CP Cards in slots 5 and 6;
- Incoming power to the four power supplies.

If a slot has a filler panel in place of a 16-port card, CP card, or power supply, the LEDs for that slot on the WWN card and bezel do not light up.

WARNING: Although the information stored in the WWN card is also stored in the flash memory of the CP cards, the switch should not be rebooted while the WWN card is uninstalled, as this can cause the switch to boot incorrectly.

Note: The LED patterns may temporarily change during POST and other diagnostic tests.status or fail LED on the WWN card flashes, the power LED on the WWN card also flashes for increased visibility. The LED patterns may temporarily change during POST and other diagnostic tests.



❶ Status LED for 16-port cards
❷ Power LED for 16-port cards
❸ CP card power LED
❹ CP card status LED
❺ Power supply power LED
❻ Power supply status LED

Figure 26: WWN card LEDs

SFPs

The HP StorageWorks Core Switch 2/64 accommodates 32 to 128 SFPs (Small Form Factor Pluggable). The SFPs supported are the SWL (short wavelength) and LWL (long wavelength) fibre optics. Shortwave SFPs have black dots visible from the front. Longwave SFPs have blue dots visible from the front. The SFPs qualified by HP are 1Gb/2Gb capable.

To install an SFP, position the SFP so that the key (the tab near the cable-end of the SFP) is on top and insert the SFP into the port until it is firmly seated and the latching mechanism clicks. For more specific instructions, refer to the SFP manufacturer's documentation.

Note: The SFP is keyed so that it can only be inserted with the correct orientation into the port. If the SFP does not slide in easily, ensure it is correctly oriented.

Interpreting POST Results

Each time the switch is powered on or reset, the switch automatically performs POST, a system check during which LED patterns may vary.

To verify that POST completed without errors:

- Verify that all LEDs return to a normal state after POST is complete. Use the `slotShow` command to check the status of the slots.
- Verify that the switch prompt displays when POST completes. If it does not display, POST was not successfully completed. Contact HP support.
- Review the system log. Any errors detected during POST are written to the system log, accessible through the `errShow` command.

Performing Diagnostic Tests

The diagnostic tests provided on the switch include tests of internal connections and circuitry, and SFPs and fiber optic cables in use. The tests are implemented by command, either through a telnet session or through a terminal set up for a serial connection to the switch. Some tests require the ports to be connected to each other by external cables, to allow diagnostics to verify the serializer/deserializer interface and to test the attached SFP and cable.

All diagnostic tests are run at link speeds of 1 Gbps and 2 Gbps.

Note: Diagnostic tests may temporarily lock the transmit and receive speed of the links to a specific speed.

Environmental Status and Maintenance Commands

The following commands display environmental and other information.

Note: Commands are shown here with mixed capitalization for easier reading, but can be entered with all lower-case characters.

chassisShow

This command provides information about all the FRU components, as shown in the following truncated example:

```
switch12k:admin> chassisShow
SW BLADE  Slot: 3
    Header Version:         1
    Power Consume Factor:   -180
    Part Num:       60-0001532-03
    Serial Num:     1013456800
    Manufacture:            Day: 12  Month:  6  Year: 2001
    Update:                 Day: 15  Month:  7  Year: 2001
    Time Alive:             28 days
    Time Awake:             16 days
    ID:                     555-374757
    Part Num:               234-294-12345
    Serial Num:             2734658
    Revision Num:           A.00

    CP BLADE  Slot: 6
    Header Version:         1
    Power Consume Factor:   -40
Part Num:       60-0001604-02
    Serial Num:     FP00X600128
    Manufacture:            Day: 12  Month:  6  Year: 2001
    Update:                 Day: 15  Month:  7  Year: 2001
    Time Alive:             61 days
    Time Awake:             16 days
    ID:                     555-374757
    Part Num:               236-296-12350
    Serial Num:             2836542
    Revision Num:           A.00

    <output truncated>
```

slotShow

This command displays info about which slots are occupied, as shown in the following example.

```
switch:admin> slotShow
Slot   Blade Type   ID    Status
   ---------------------------------
   1      SW BLADE     2     FAULTY
   2      SW BLADE     2     DISABLED
   3      SW BLADE     2     ENABLED
   4      SW BLADE     2     DIAG RUNNING POST2
   5      CP BLADE     1     ENABLED
   6      CP BLADE     1     ENABLED
   7      UNKNOWN           VACANT
   8      SW BLADE     2     DIAG RUNNING POST1
   9      SW BLADE     2     INSERTED, NOT POWERED ON
   10     UNKNOWN           VACANT
```

sensorShow

This command displays the current temperature readings, fan status and RPM, power supply and fan readings from sensors, as shown in the following example. This command is per logical switch.

```
sw0_155:admin> sensorShow
sensor  1: (Temperature) is Ok, value is 36 C
sensor  2: (Temperature) is Ok, value is 35 C
sensor  3: (Temperature) is Absent
sensor  4: (Temperature) is Absent
sensor  5: (Temperature) is Ok, value is 21 C
sensor  6: (Temperature) is Ok, value is 21 C
sensor  7: (Fan        ) is Ok, speed is 2576 RPM
sensor  8: (Fan        ) is Ok, speed is 2481 RPM
sensor  9: (Fan        ) is Ok, speed is 2463 RPM
sensor 10: (power supply ) is Ok
sensor 11: (power supply ) is Faulty
sensor 12: (power supply ) is Ok
sensor 13: (power supply ) is Faulty
```

psShow

This command displays the current status of the power supplies, as shown in the following example.

```
sw0_155:admin> psShow
power supply #1 is OK
power supply #2 is OK
power supply #3 is OK
power supply #4 is OK
```

fanShow

This command displays status and RPM of the blower assemblies, as shown in the following example.

```
sw0_155:admin> fanshow
Fan #1 is OK, speed is 2576 RPM
Fan #2 is OK, speed is 2481 RPM
Fan #3 is OK, speed is 2481 RPM _
```

errShow

This command shows the switch error log that lists the status of marginal/failed components. The following example shows that the Switch 0 blower assembly has failed.

```
sw0_155:admin> errshow
Error 15
--------
0x2e3 (fabos): Dec 29 15:57:34
Switch: 0, Error FW-BELOW1, 3, envFan001 (Env Fan 1) is below
low boundary. current value : 0 RPM. (faulty)
```

Installing Core Switch 2/64 FRUs

4

The Core Switch 2/64 does not require regular maintenance, and is designed to minimize loss of connectivity within the SAN. If any failure does occur, a number of components are available as field replaceable units (FRUs).

The power supplies, port cards, CP cards, and blower assemblies can all be replaced in the field without special tools. Replacement instructions are provided with all replacement units ordered. The Core Switch 2/64 can continue operating during the FRU replacements if the conditions specified in the corresponding procedures are followed.

This chapter describes replacement procedures for the following FRUs:

FRU Summary

The power supplies, 16-port cards, CP cards, and blower assemblies are hot-swappable FRUs. These components are replaced in the field without special tools.

If a Fabric Watch license is installed on the Core Switch 2/64, Fabric Watch alarms can be configured for each FRU. For additional product information, go to: http://www.hp.com/products1/storage/products/san/fibreswitches/coreswitch2_64/index.html.

Notifying the Switch of a Hot Swap

You can notify the Core Switch 2/64 of a hot swap request in two ways: the commands `slotPowerOff` and `slotPowerOn`, or by clicking the ejector handles on the 16-port card.

Checking FRU Status

To determine the status of individual FRUs, first visually check the LEDs on each component. See Chapter 3, Operating the Core Switch 2/64, for a complete list of LEDs and their meanings.

Use the commands described in the following sections to monitor component status. For additional information about how to check the status of hardware components using the CLI, go to: http://www.hp.com/products1/storage/products/san/fibreswitches/coreswitch2_64/index.html.

Commands are not case sensitive.

Display Switch Status

Use `chassisShow` to determine system status as shown in the following truncated example.

```
switch12k:admin> chassisShow
SW BLADE  Slot: 3
   Header Version:         1
   Power Consume Factor:   -180
Part Num:       60-0001532-03
Serial Num:     1013456800
   Manufacture:            Day: 12  Month:  6  Year: 2001
   Update:                 Day: 15  Month:  7  Year: 2001
   Time Alive:             28 days
```

```
   Time Awake:             16 days
   ID:                     555-374757
   Part Num:               234-294-12345
   Serial Num:             2734658
   Revision Num:           A.00

   CP BLADE  Slot: 6
   Header Version:         1
   Power Consume Factor:   -40
   Part Num:       60-0001604-02
Serial Num:     FP00X600128
   Manufacture:            Day: 12  Month:  6  Year: 2001
   Update:                 Day: 15  Month:  7  Year: 2001
   Time Alive:             61 days
   Time Awake:             16 days
   ID:                     555-374757
   Part Num:               236-296-12350

   Serial Num:             2836542
   Revision Num:           A.00
```

Display Slot Status

Use `slotShow` to list slot status.

```
switch:admin> slotShow
Slot   Blade Type   ID    Status
   ---------------------------------
   1      SW BLADE     2     FAULTY
   2      SW BLADE     2     DISABLED
   3      SW BLADE     2     ENABLED
   4      SW BLADE     2     DIAG RUNNING POST2
   5      CP BLADE     1     ENABLED
   6      CP BLADE     1     ENABLED
   7      UNKNOWN            VACANT
   8      SW BLADE     2     DIAG RUNNING POST1
   9      SW BLADE     2     INSERTED, NOT POWERED ON
   10     UNKNOWN            VACANT
```

Display Component Temperatures

Use `sensorShow` to display current temperature readings, fan status, and Revolutions per Minute (RPM) as shown in the following example. This command is per logical switch.

```
sw0_155:admin> sensorShow
sensor  1: (Temperature) is Ok, value is 36 C
sensor  2: (Temperature) is Ok, value is 35 C
sensor  3: (Temperature) is Absent
sensor  4: (Temperature) is Absent
sensor  5: (Temperature) is Ok, value is 21 C
sensor  6: (Temperature) is Ok, value is 21 C
sensor  7: (Fan         ) is Ok, speed is 2576 RPM
sensor  8: (Fan         ) is Ok, speed is 2481 RPM
sensor  9: (Fan         ) is Ok, speed is 2463 RPM
sensor 10: (power supply ) is Ok
sensor 11: (power supply ) is Faulty
sensor 12: (power supply ) is Ok
sensor 13: (power supply ) is Faulty
```

Display Power Supply Status

Use `psShow` to display power supply status as shown in the following example.

```
sw0_155:admin> psShow
power supply #1 is OK
power supply #2 is OK
power supply #3 is OK
power supply #4 is OK
```

Display Blower Assembly Status

Use `fanShow` to list blower assembly statistics as shown in the following example.

```
sw0_155:admin> fanshow
Fan #1 is OK, speed is 2576 RPM
Fan #2 is OK, speed is 2481 RPM
Fan #3 is OK, speed is 2481 RPM _
```

Display Failed Components

Use `errShow` to display the switch error log. The error log lists the status of marginal/failed components. The following example shows that the Switch 0 blower assembly has failed.

```
sw0_155:admin> errshow

Error 15

--------

0x2e3 (fabos): Dec 29 15:57:34

Switch: 0, Error FW-BELOW1, 3, envFan001 (Env Fan 1) is below
low boundary. current value : 0 RPM. (faulty)
```

16-Port Card or Filler Panel Summary

The following sections describe the recommended procedure for 16-port card removal and installation. The Core Switch 2/64 continues to operate without interruption during this procedure. However, if a port card is being removed, any cables connected to that port card must be disconnected. You can notify the Core Switch 2/64 of a hot swap request in either of two ways: the commands `slotpoweroff` and `slotpoweron`, or by clicking the ejector handles on the port card.

16-Port Card Precautionary Guidelines

Review the following guidelines before installing the card in a slot:

- Do not remove the 16-port card while the switch is running diagnostic tests. Wait for the status LED to turn off before removing a 16-port card.
- Install 16-port cards in any combination of slots 1-4 (“switch 0") and 7-10 (“switch 1").
- Wear a grounded ESD strap when handling a 16-port card. The grounding connection on the chassis is located above the power connectors.
- Hold the 16-port card by the edges of the metal pan (do not hold by ejectors).
- Install a filler panel in any empty slots to ensure correct cooling of the chassis and protection from dust.

For more information about how to check the status of hardware components using command line interface, refer to the *HP StorageWorks Fabric OS Procedures Version 3.1.x/4.1.x User Guide*.

Caution: Disassembling any part of a 16-port card or filler panel voids the part warranty and regulatory certifications. There are no user-serviceable parts inside the 16-port card or filler panel.

Time and Items

Time and items required to replace a filler panel or 16-port card are:

- Time required: Less than 10 minutes.
- Items required:
  - ESD (electrostatic discharge) grounding strap
  - Workstation computer

Replacing a Filler Panel or 16-port Card

Use these steps to replace a filler panel or 16-port card.

Note: There are two versions of the Port Card Filler Panel: one with ejector handles and one without.

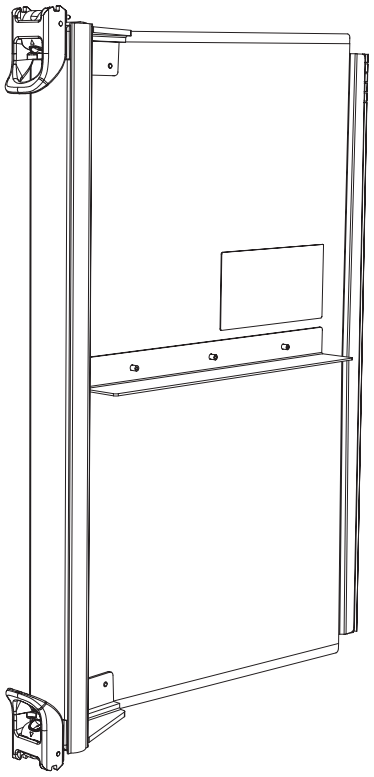
---

1. Remove the filler pane (see Figure 27):

Note: You should wear a grounded ESD strap when handling a port card. The chassis has a grounding connection above the power connectors. Hold the port card by the edges of the metal pan (do not hold by the ejectors).

---

   a. Push in the yellow buttons on each ejector.
   b. Lift both ejector handles all the way open.
   c. If the filler panel does not have ejector handles, pull on the handle in the middle of the panel.
   d. Slide the filler panel out of the chassis.



SHR-2523A

Figure 27: Filler panel for port cards (version that has ejectors)

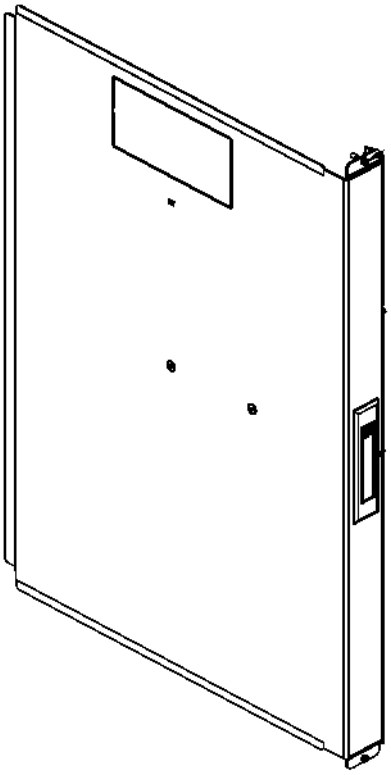


Figure 28: Filler panel for port card slots (version that does not have ejectors)

2. To remove a 16-port card, you must first turn off power to the card slot:
   a. Log on the switch from a terminal emulator application, (such as HyperTerminal on Windows systems, or TERM in a Unix or Linux environment).
   b. Configure terminal emulator settings. Refer to Chapter 2, Setting Network Addresses via a Network Connection on page 76 for correct values.
   c. Turn off power to the appropriate 16-port card. For example, if removing the 16-port card in slot 4, enter:

      ```
      slotPowerOff 4
      ```

   d. Check that 16-port card LEDs are off.

e. Wait for the Power LED to turn off.

Caution: If removing a 16-port card, wait for the Status LED to turn off before removing the card.

f. Disconnect any SFP transceivers and cables from the 16-port card.

g. Slide the 16-port card out of the chassis.

3. To install the new 16-port card or filler panel in the slot (see Figure 29 on page 131):

Note: Install a filler panel in any empty slots to ensure proper chassis cooling, and protection from dust.

- For a port card or a filler panel that has ejector handles:

a. Orient the 16-port card or filler panel so that the ejectors are at the front of the chassis and the flat side of the 16-port card or filler panel is on the left.

b. Align the flat side of the 16-port card or filler panel inside the upper and lower rail guides in the slot.

c. Slide the 16-port card or filler panel into the slot, with slight pressure to the left, until it is firmly seated.

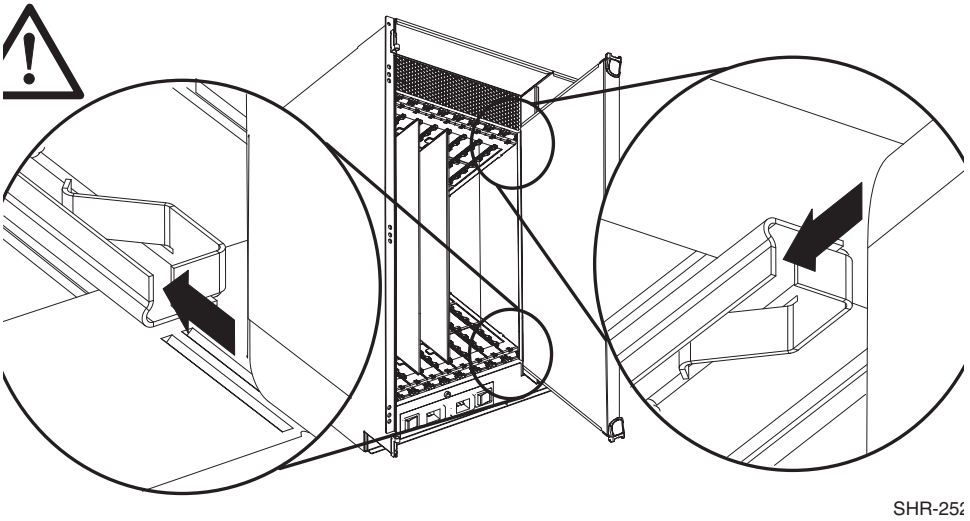


Figure 29: Alignment guides in card slots

d. Close the ejectors by rotating the black handles toward the center of the 16-port card or filler panel until the ejectors lock. The levering action of the handles seats the 16-port card or filler panel in the slot.

- For a filler panel that does not have ejector handles, align the flat side of the filler panel inside the upper and lower rail guides in the slot, and slide the filler panel into the slot, with slight pressure to the left, until it is firmly seated.

Caution: Do not force the card or filler panel in the slot. If the 16-port card or filler panel does not slide in easily, adjust the alignment with the rail guides accordingly.

4. Verify that the 16-port card was installed properly as follows:
   a. Check that the 16-port card power status LED shows a steady green light (it may require a few seconds to turn on).
   b. Check that the 16-port card is firmly seated. The front of the 16-port card should be flush with adjacent 16-port cards or filler panels.

Note: The LED patterns may temporarily change during POST and other diagnostic tests.

5. Install SFP transceivers and cables in the 16-port card, as required. Refer toChapter 2, Connecting SFPs on page 82.

Recommendations for Cable Management

- You can manage cables in a variety of ways, such as routed down through the cable management tray or routed out either side of the chassis, and by using patch panels or cable channels on the sides of the cabinet.
- To keep LEDs visible and prevent having to disconnect cables when removing neighboring cards, route fiber optic and other cables directly downwards, instead of across adjacent cards or in front of the power supplies.
- Leave at least one meter of slack for each fiber optic cable. This provides room to remove and replace the port card, allows for inadvertent movement of the rack, and helps prevent the cables from being bent to less than the minimum bend radius (the minimum bend radius for a 50 micron cable is 2 inches under full tensile load and 1.2 inches with no tensile load).
- Use the cable guides provided with the Core Switch 2/64 to group the cables by trunking ports (groups of four neighboring ports). These guides help to keep individual ports accessible by keeping the cables evenly spaced, and also help to provide clearance for the removal of a neighboring card.

CP Card Summary

The following sections describe the recommended procedure for CP card removal and installation. The Core Switch 2/64 continues to operate without interruption during this procedure if at least one CP card remains installed.

However, if the CP card you're replacing is currently the active CP card, traffic over the fabric stops temporarily until failover to the standby CP card is complete. Failover takes less than one minute and occurs automatically as soon as the active CP card is removed. If there is no standby CP card, the Core Switch 2/64 stops functioning until at least one CP card is installed.

Note: The telnet command `haShow` provides information about which CP card is the active CP card.

After a CP card is replaced, it automatically assumes the native IP address and host name assigned to that slot. The default IP address and host name for slot 5 (CP0) is 10.77.77.75. The default IP address and host name for slot 6 (CP1) is 10.77.77.74.

WARNING: Do not attempt to replace the Real Time Clock (RTC) battery on the CP card. There is danger of explosion if the battery is incorrectly replaced. Contact your switch supplier, since the battery must be replaced with the same type of battery as recommended by the manufacturer, and must be disposed of according to the manufacturer's instructions.

Time and Items

Time and items required to replace a filler panel or CP card include:

- Time required: Approximately 30 minutes.
- Items required:
  - ESD (electrostatic discharge) grounding strap
  - Workstation computer
  - Serial cable provided with the Core Switch 2/64
  - IP address of an FTP server for backing up the switch configuration

Confirming a Failed CP Card

Before replacing the CP card, refer to the following to verify the necessity of the replacement.

The following events may indicate that a CP card is faulty:

- The Status LED on the CP card is orange, or the Power LED is not lit.
- The `slotshow` command does not show that the CP card is enabled.
- The CP card does not respond to commands or private ethernet activities, or the serial console is not available.
- The `hashow` command indicates that the CP cards have not achieved redundancy.
- The calendar clock is inaccurate, or the CP card does not boot up or shut down normally.
- Any of the following messages display in the error log:
  - `Slot unknown` message relating to a CP slot
  - CP card errors
  - FRU: FRU_FAULTY messages for a CP card
  - Configuration loader messages or `Sys PCI config` messages
  - Generic system driver messages (`FABSYS`)
  - Platform system driver messages (`Platform`)
  - EM messages that indicate a problem with a CP card
  - Function fail messages for the CP master

    For complete information about diagnostic and error messages, refer to the *Diagnostics and System Error Message Reference* and the *HP StorageWorks Fabric OS Procedures Version 3.1.x/4.1.x User Guide*.

If none of the previous items are true, and you have not already confirmed the CP card failure with the switch supplier, contact the switch supplier before continuing.

Recording Critical Switch Information

1. Create a serial connection to the healthy CP card:
   a. Disable any serial communication programs running on the workstation (such as synchronization programs).
   b. Insert a serial cable into the terminal serial port (second serial port from the top; see Figure 20 on page 76).
   c. Connect other end of serial cable to a serial port on the workstation. If necessary, the adapter on the serial cable can be removed to allow for a serial RJ45 connection.
   d. Open the terminal emulator application and configure as follows:
      — For Windows systems:

Parameter	Value
Bits per second	9600
Databits	8
Parity	None
Stop bits	1
Flow control	None

      — For most UNIX systems, enter the following string at the prompt:

```
tip /dev/ttyb -9600
```

   e. When the terminal emulator application stops reporting information, press Enter.
2. Log into the healthy CP card as Admin, then enter **0** to log into Switch 0 (see Figure 30). The default password is password.

```
Fabric OS (cp0)
cp0 Console Login: admin
Password:
Enter Switch Number to Login <0 or 1>: 0
SW0:admin>
```

Figure 30: Sample output for logging into switch 0 from a serial console

3. Enter the `hashow` command to determine which CP card is active (see Figure 31).

```
SW0:admin> haShow
Local CP (Slot 5, CP0): Active
Remote CP (Slot 6, CP1): Standby, Healthy
HA enabled, Heartbeat Up
SWO:admin>
```

Figure 31: Sample output for the hashow command

Note: Enter all remaining commands from the serial console for the **active** CP card, unless otherwise indicated. For more information about commands, refer to the *HP StorageWorks Fabric OS Version 3.1.x/4.1.x Reference Guide.*

---

4. If the healthy CP card is performing as the active CP card, continue with step 7. If the faulty CP card is performing as the active CP card, fail over the cards (see Figure 32):
   a. Create a serial connection to the faulty CP card (repeat step 1**,** on page 135).
   b. Log into the serial console as Admin and enter **0** to log into logical Switch 0.
   c. Enter the `hafailover` command. The healthy CP card becomes the active CP card.
   d. Wait until the Status LED on the healthy CP card is no longer lit (indicates failover is complete).
   e. Enter the `hashow` command from the serial console for the healthy CP card to verify the failover.

```
Fabric OS (cp1)
cp1 Console Login: admin
Password:
Enter Switch Number to Login <0 or 1>: 0
SW0:admin> hashow
Local CP (Slot 6, CP1) : Active
Remote CP (Slot 5, CP0) : Standby
HA Enabled, Heartbeat Up
SW0:admin>

SW0:admin> hafailover
Warning: This command is being run on a control processor(CP)
based system and will cause the active CP to reset. This will
cause disruption to devices attached to both switch 0 and switch 1
and will require that existing telnet sessions be restarted.
To just reboot a logical switch on this system, use command
switchreboot(1M) on the logical switch you intend to reboot.
Are you sure you want to reboot the active CP [y/n]? y
SW0:admin>

SW0:admin> hashow
Local CP (Slot 6, CP1) : Standby, Healthy
Remote CP (Slot 5, CP0) : Active
HA Enabled, Heartbeat Up
SW0:admin>
```

Figure 32: Logging in to switch 0 from a serial console, then failing over

5. Enter the `version` command to record the version of the active CP card.
6. Enter the `hadisable` command from the active CP card to prevent failover or communication between the CP cards during the replacement.
7. From the serial console for the healthy (and active) CP card, back up the current configuration for logical Switch 0 (see Figure 33):
8. Enter the `configupload` command.
   This command uploads the switch configuration to a specified FTP server.
9. Enter the requested information at the prompts.

10. Log into logical Switch 1 and back up the current configuration for Switch 1 (see Figure 33):
    a. From the serial console for the healthy CP card, enter the `login` command.
    b. Log in to the switch as Admin and enter **1** to log in to Switch 1.
    c. Enter the `configupload` command.
    d. Enter the requested information at the prompts.

```
SW0:admin> configupload
Server Name or IP Address [host]: 123.456.78.90
User Name [None]: user
File Name [config.txt]: config.txt
Password: xxxxxx
upload complete
SW0:admin>

SW0:admin> login
cp0 login: admin
Password: xxxxxx
Enter Switch Number to Login <0 or 1>: 1
SW1:admin>

SW1:admin> configupload
Server Name or IP Address [host]: 123.456.78.90
User Name [None]: user
File Name [config.txt]: config.txt
Password: xxxxxx
upload complete
SW1:admin>
```

Figure 33: Backing up the configuration for logical switch 0 and switch 1

Replacing a Filler Panel or CP Card

Use these steps to remove a filler panel or CP card.

Caution: Wear an ESD grounding strap when handling a CP card. The chassis provides a grounding connection above the power connectors. Hold the CP card by the edges of the metal pan (not by the ejectors).

1. If removing a filler panel, push the yellow button on each ejector in, open both ejectors all the way, and slide the filler panel out of the chassis.
2. If removing a CP card, first determine which CP card is the active CP card as follows:
   a. Log onto the switch from a terminal emulator application, (such as HyperTerminal on Windows systems, or TERM in a Unix or Linux environment).
   b. Configure terminal emulator settings. Refer to the "Setting Network Addresses via a Network Connection" section in chapter 2 for correct values.
   c. Enter `haShow` at the prompt.
   d. If the card you are replacing is the:
      — Standby CP card, continue with step 2.
      — Active CP card, type `haFailover` at the prompt. This command causes the two CP cards to switch roles, (that is, the standby CP card becomes the new active CP card).

Note: The `haFailover` command causes the active CP card to failover to the standby CP card. The standby CP card is now the active CP card.

3. Disconnect the following cables, if present:
   a. Modem cable from the modem serial port
   b. Serial cable from the terminal serial port
   c. Ethernet cable from the Ethernet port

4. Notify the switch of a hot swap request by pushing the yellow tab on each ejector in, and pushing the black handles slightly open until you hear a click. Wait for the Status LED to turn off.

Note: Wait for the Status LED to turn off in response to the hot-swap request before uninstalling the card.

---

5. Open both ejectors all the way, and slide the CP card out of the chassis.
6. Install the new CP card or filler panel in the slot, as follows (see Figure 34).
   a. Orient the CP card or filler panel so that the ejectors are at the front of the chassis and the metal pan is on the left.
   b. Align the flat metal side of the CP card (see Figure 34) or filler panel inside the upper and lower rail guides in the slot, and slide the CP card or filler panel into the slot until it is firmly seated.
   c. Close the ejectors by pressing in the black handles toward the CP card or filler panel, until the ejectors lock. The levering action of the ejectors seat the CP card or filler panel in the chassis.

Caution: Do not force the card or filler panel in the slot. If the 16-port card or filler panel does not slide in easily, adjust the alignment with the rail guides accordingly.

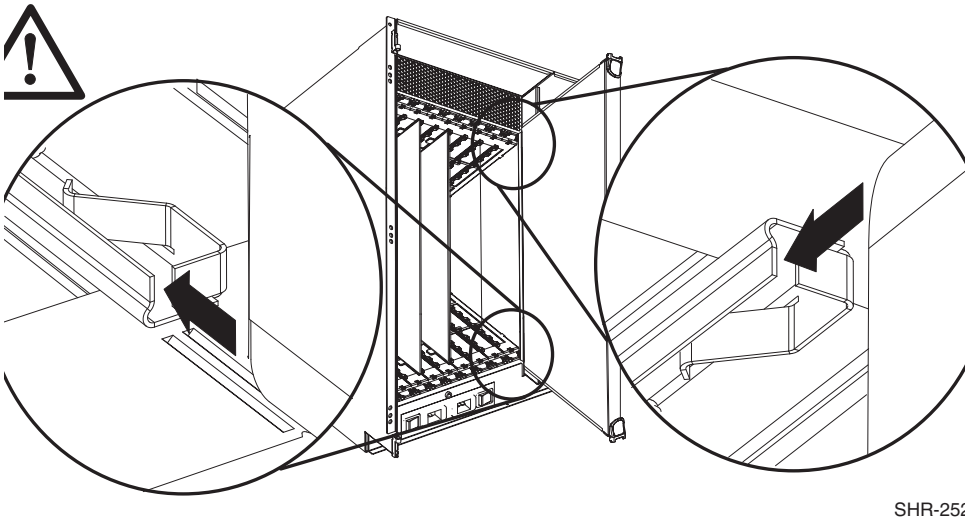


Figure 34: Aligning the CP card

7. Verify that the power LED on the CP card shows a steady green light (it may require a few seconds to turn on). If it does not turn on, check that the CP card is firmly seated.

Note: The LED patterns may temporarily change during POST and other diagnostic tests.

d. Refer to the section Setting Network Addresses via a Network Connection, on page 76 in Chapter 2 for correct values. Connect cables as required to the CP card, as follows:

— Modem cable to the modem serial port

— Serial cable to the terminal serial port

— Ethernet cable to the Ethernet port

Note: Do not route cables in front of the exhaust vent.

About the CP Card (or RTC) Battery

Each CP card includes a lithium carbon-monoflouride coin cell battery with a 10-year life expectancy. If the real-time clock (RTC) loses time, then the battery may need to be replaced. Contact your switch supplier if the RTC begins to lose time.

WARNING: Do not attempt to replace the Real Time Clock (RTC) battery on the CP card. There is danger of explosion if the battery is incorrectly replaced. Contact your switch supplier, since the battery must be replaced with the same type of battery as recommended by the manufacturer, and must be disposed of according to the manufacturer's instructions.

Verifying Operation of the New CP Card

1. Verify that boot and POST are complete on the new CP card (a minimum of 3 minutes), and the CP cards have achieved failover redundancy.
   a. Wait until the Status LEDs on both CP cards are not lit.
   If Fabric OS v4.0.2 or later firmware is installed on both CP cards, the active CP card's Status LED displays orange until the active CP card is fully operational, and the standby CP card's Status LED displays orange until the CP cards have achieved failover redundancy.
   b. From the serial console for the active CP card (should still be the CP card that was not replaced), enter the `haShow` command, and verify that the command output includes `HA Enabled Heartbeat Up`. The message `HA-state in sync` also displays.

If not, POST is not complete or the CP cards have not yet achieved redundancy (as shown in Figure 35). Wait a minute or two and reenter the command, until you can verify that redundancy has been achieved.

```
SW1:admin> haShow
Local CP (Slot 5, CP0): Active
Remote CP (Slot 6, CP1): Standby, Healthy
HA enabled, Heartbeat Up, HA State not in sync
SW1:admin>
```

Figure 35: Sample output for hashow command before redundancy is achieved

---

Note: If `hashow` command indicates any errors after redundancy is achieved, contact the switch supplier.

---

2. Enter the `slotshow` command. The command output should show the new CP card as **enabled** (see Figure 36).

```
SW1:admin> slotShow
Slot Blade Type ID Status
--------------------------------
1 SW BLADE 2 ENABLED
2 SW BLADE 2 ENABLED
3 SW BLADE 2 ENABLED
4 SW BLADE 2 ENABLED
5 CP BLADE 1 ENABLED
6 CP BLADE 1 ENABLED
7 SW BLADE 2 ENABLED
8 SW BLADE 2 ENABLED
9 SW BLADE 2 ENABLED
10 SW BLADE 2 ENABLED
SW1:admin>
```

Figure 36: Sample output for the slotshow command

3. Determine the version (see Figure 37):
   - For any firmware version, you can enter the `version` command

- For Fabric OS v4.0.0c and later firmware, the `firmwareshow` command is available.

```
SW1:admin> version
Kernel: 2.4.2
Fabric OS: v4.0.0
Made on: Fri Feb 1 23:02:08 2002
Flash: Fri Feb 1 18:03:35 2002
BootProm: 3.1.13b
SW1:admin>

SW1:admin> firmwareshow
Local CP (Slot 5, CP0): Active
Primary partition: v4.0.2
Secondary Partition: v4.0.2
Remote CP (Slot 6, CP1): Standby
Primary partition: v4.0.2
Secondary Partition: v4.0.2
SW1:admin>
```

Figure 37: Sample output for the version and firmwareshow commands

4. If the firmware versions on the replacement card does not match the active CP card, bring the replacement card to the same firmware level as the active card. Check with the switch supplier for supported versions.
   - Download the firmware, using either of the following command options (see Figure 38):
     - Enter `firmwaredownload` to download the firmware to both CP cards at the same time. Enter all requested information and choose the **reboot** option.
       If the switch is running Fabric OS v4.0.2b or later, a message displays warning you that this command causes the active CP card to reset. If this message displays, enter **Y** to continue.
     - If the shipped version of the replacement card is prior to v4.1, enter the `firmwaredownload -s` command to download the firmware to only *one* of the CP cards. Enter all requested information and choose the **reboot** option.

- For more information about the `firmwaredownload` command, refer to the *HP StorageWorks Fabric OS Version 3.1.x/4.1.x Reference Guide*.

```
SW1:admin> firmwaredownload
Server Name or IP Address: 123.456.78.90
User Name: user
File Name: /v4.0.2/release.plist
Password: xxxxxx
Full Install (Otherwise upgrade only) [Y]:
Do Auto-Commit after Reboot [Y]:
Reboot system after download [N]: y
Start to install packages.....
dir ##################################################
terminfo
##################################################
<some output not shown>
glibc ##################################################
sin ##################################################
Write kernel image into flash.
file verification SUCCEEDED
Firmwaredownload completes successfully.
SW1:admin>
```

Figure 38: Sample output for the firmwaredownload command

5. Verify the reboot is complete and the CP cards have achieved failover redundancy.
   a. Wait until the Status LEDs on both CP cards turn off.
   b. Enter the `hashow` command, and verify that the command output includes `HA Enabled Heartbeat Up`.
   If not, wait a minute and reenter the command, until you have verified that redundancy is achieved.
6. Enter the `version` or `firmwareshow` command to verify the firmware version has been updated (see Figure 38).
7. Create a serial connection to the new CP card (instructions provided in step 1, on page 135).

8. Log into the new CP card as Admin, entering **0** to log into logical Switch 0 (see Figure 39).

```
Fabric OS (cp1)
cp1 Console Login: admin
Password:
Enter Switch Number to Login <0 or 1>: 0
SW0:admin>
```

Figure 39: Sample output for logging in to switch 0 from a serial console

9. From the serial console for the new CP card, enter the `hafailover` command to fail the active CP card over to the new CP card.
10. Verify that the configuration has successfully propagated to the new CP card by checking any configuration parameters for which you have specified non-default values.
    To do this, enter the `configshow` command followed by a text string (in quotes) that relates to the parameter. For example:

    ```
    configshow "fabric"
    ```

Note: Entering the `configshow` command *without* a filter prints out approximately 1000 lines. For more information about this command refer to the *HP StorageWorks Fabric OS Version 3.1.x/4.1.x Reference Guide.*

This limits the command output to entries that contain that text string (see Figure 40).

```
SW0:admin> configshow “fabric”
fabric.domain:5
fabric.ops.BBCredit:16
fabric.ops.E_D_TOV:2000
fabric.ops.R_A_TOV:10000
fabric.ops.dataFieldSize:2112
fabric.ops.mode.fcpProbeDisable:0
fabric.ops.mode.isolate:0
fabric.ops.mode.longDistance:0
fabric.ops.mode.noClassF:0
fabric.ops.mode.tachyonCompat:0
fabric.ops.mode.unicastOnly:0
fabric.ops.mode.useCsCtl:0
fabric.ops.mode.vcEncode:0
<remaining output not shown>
SW0:admin>
```

Figure 40: Sample output for the configshow Command with “fabric” as filter

11. Enter the `haenable` command.
12. If the switch configuration does not appear to have replicated correctly, download the switch configurations that were backed up (see Figure 41).
    a. Enter the `switchdisable` command to disable the current logical switch (should still be Switch 1).
    b. Enter the `configdownload` command and enter the requested information.

Note: If the switch is running Fabric OS v4.0.2, a message displays cautioning you about downloading the correct configuration file. If this message displays, enter **y** to continue.

    c. Once the configuration has been downloaded, enter the `switchenable` command.
    d. Log into Switch 0 and repeat step a through step c.

```
SW0:admin> switchdisable

SW0:admin> configdownload
Server Name or IP Address [host]: 123.456.78.90
User Name [None]: user
File Name [config.txt]: config.txt
Password: xxxxxx
Committing configuration...done.
download complete
SW0:admin>

SW0:admin> switchenable
10 9 8 7 6 5 4 3 2 1
fabric: Principal switch
fabric: Domain 1

SW0:admin> login
cp1 login: admin
Password:
Enter Switch Number to Login <0 or 1>: 1
SW1:admin>

SW1:admin> switchdisable

SW1:admin> configdownload
Server Name or IP Address [host]: 123.456.78.90
User Name [None]: user
File Name [config.txt]: config.txt
Password: xxxxxx
Committing configuration...done.
download complete

SW1:admin> switchenable
10 9 8 7 6 5 4 3 2 1
fabric: Principal switch
fabric: Domain 1
SW1:admin>
```

Figure 41: Sample output for downloading configuration to both logical switches

13. Pack the old CP card in the packaging provided with the new card, and contact the switch supplier to determine the return procedure.

Power Supply Summary

The Core Switch 2/64 continues to operate during the replacement if at least one power supply continues operating for every four 16-port cards installed. HP recommends a minimum of two power supplies.

Note: You do not need to notify the Core Switch 2/64 of a hot swap request before removing a power supply. Power supply filler panels are not required to ensure correct air flow.

The left power connector provides power to the power supplies in slots #1 and #3, and the right power connector provides power to the power supplies in slots #2 and #4. The power connectors and the power supply slots are color-coded to identify which power connectors provide power to which power supply slots.

Replacing the Power Supply or Filler Panel

Use this procedure to remove and install a power supply or power supply filler panel.

Caution: To protect against AC failure, HP recommends a minimum of one power supply in slot #1 or slot #3, and one in slot #2 or #4. If only two power supplies are installed and they are both installed in slots corresponding to the same power cable, unplugging a single power cable will power down the entire chassis. If adequate power is abruptly lost such as through removal of a power supply, the entire switch is powered down; the power off order designated by `powerOffListSet` is not followed.

If the Core Switch 2/64 will operate during the replacement procedure, check the LEDs to verify that the minimum of two power supplies are functioning before removing a power supply.

1. Determine whether adequate power to keep the chassis operating is available throughout the replacement. If adequate power is not consistently available, shut down the switches gracefully as follows:
   a. Open a telnet session to the active CP card and log into Switch 1 as Admin.
   b. Enter the `switchshutdown` command.
   c. After the message `Cleaning up kernel modules....Done` displays, repeat step a through step c for Switch 0.
   d. Power off the chassis: Flip both AC power switches to the off position (the 0 on the switch).
2. Remove the current power supply or filler panel from the chassis as follows:

Caution: Support the power supply from underneath while removing it from the chassis.

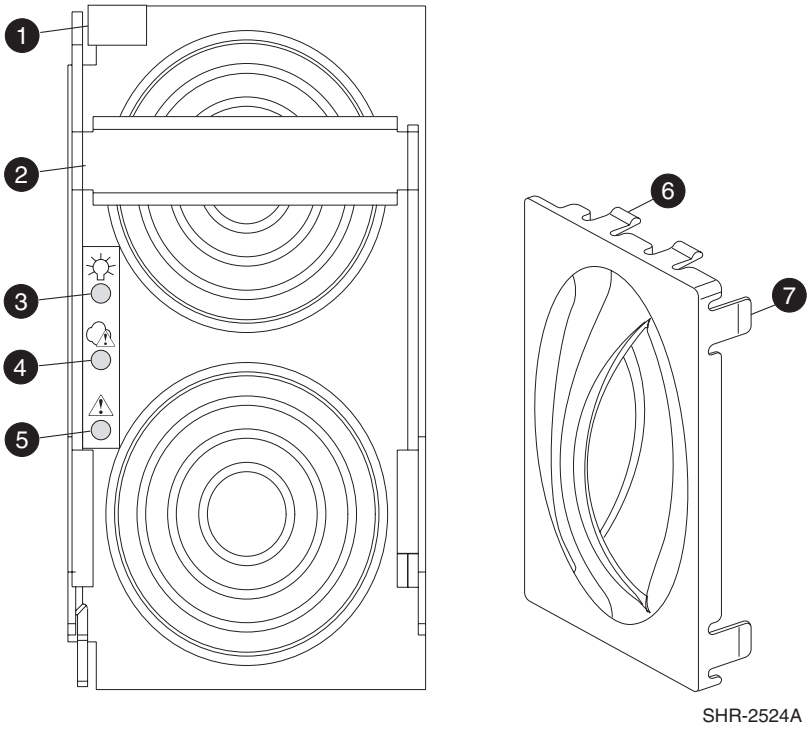
   a. To remove a power supply, push the locking tab in towards the power supply, then pull the handle out and down and use the handle to pull the power supply out of the chassis. Support the power supply from underneath while removing it from the chassis.
   b. To remove a filler panel, pull out by the handle.
3. Install the new power supply or filler panel as follows:

Caution: Do not force the installation of the power supply or filler panel. If the part does not install easily, check that it is aligned properly.

   a. Orient the power supply so the handle is toward the front of the chassis and the LEDs are on the left.
   b. Unlock the handle, and insert the power supply all the way into the slot.
   c. Push the handle up until it clicks. Verify the power supply is seated by pulling gently on the handle.

d. To install a filler panel, orient it so that the handle is vertical and side tabs are on right, then push into the slot.

4. Verify the top LED on the power supply (see Figure 42) displays a steady green light. If it does not, make sure that both power cables are plugged in and both AC switches are turned on.



❶ Locking tab
❷ Handle
❸ Power LED
❹ Predictive failure LED
❺ Fail LED
❻ Top tab (2)
❼ Side tab (2)

Figure 42: Power Supply and Filler Panel

Caution: Disassembling any part of the power supply voids the part warranty and regulatory certifications. There are no user-serviceable parts inside the power supply.

5. If the chassis was powered down, flip both AC switches to **1**. The AC power switches light up green when power is being supplied, and the Core Switch 2/64 performs POST (power-on self-test) by default.

Blower Assembly Summary

The Core Switch 2/64 requires a minimum of two operating blower assemblies. The switch continues operating during replacement only if the two remaining blower assemblies continue to operate. If more than one blower must be turned off at the same time, the Core Switch 2/64 should be turned off to prevent overheating.

Note: You do not need to notify the Core Switch 2/64 of a hot swap request before removing a blower assembly.

Time and Items

Time and items required to replace the blower assembly include:

- Time required: Less than 5 minutes
- Item required: #2 straight screwdriver

Replacing the Blower Assembly

Use this procedure to remove and install a blower assembly.

WARNING: The Core Switch 2/64 requires a minimum of two operating blower assemblies at all times. To ensure continuous adequate cooling, maintain three operating blower assemblies at all times except for the brief period when replacing a blower assembly. The 16-port cards automatically shut down if the temperature range is exceeded.

1. Obtain a #2 straight screwdriver. Before removing the blower assembly, verify the remaining two blower assemblies are functioning.

Note: The blower assembly power LED should be steady green and the fault LEDs should not be lit (see Figure 25 for LED locations).

2. Remove the blower assembly from the chassis, as follows.
   a. Use the screwdriver to loosen the thumbscrews at the top and bottom of the blower assembly.
   b. Push in the top of the handle, then pull out the lower part and pull the blower out of the chassis.

Note: Support the blower assembly from underneath while removing it from the chassis.

---

3. Install the new blower assembly in the chassis, as follows.
   a. Orient the blower assembly as shown in Figure 43 and slide into the chassis, pushing firmly to ensure it is seated.

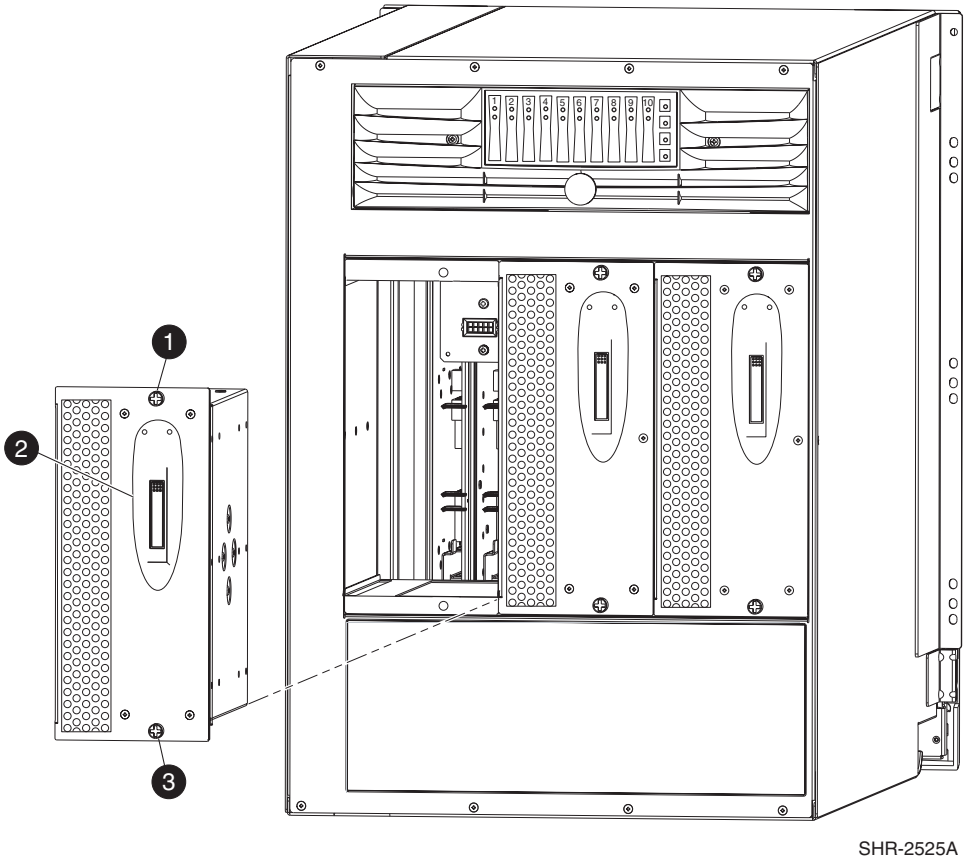


Figure 43: Replacing the blower assembly

   b. Verify that the power LED is on. If not, reseat the blower assembly.
   c. Push the top of the handle into the recess.
   d. Tighten the thumbscrews to finger-tight.

WARNING: Disassembling any part of the blower assembly voids the part warranty and regulatory certifications. There are no user-serviceable parts inside the blower assembly.

Replacing SFPs

Use these steps to replace SFPs.

Note: Purchase SFPs separately. For purchasing information, refer to Table 4 in Chapter 1.

1. Remove the appropriate cable from the SFP.
2. Disconnect the faulty SFP module from the port.
3. To install a new SFP transceiver:
   a. Position the SFP so that the key is oriented correctly to the port.
   b. Insert the SFP into the port until it is firmly seated and the latching mechanism clicks.

Note: Transceivers are keyed so that they can only be inserted with the correct orientation. If transceiver does not slide in easily, ensure it is correctly oriented. For instructions that are specific to the transceiver model, refer to the transceiver manufacturer's documentation

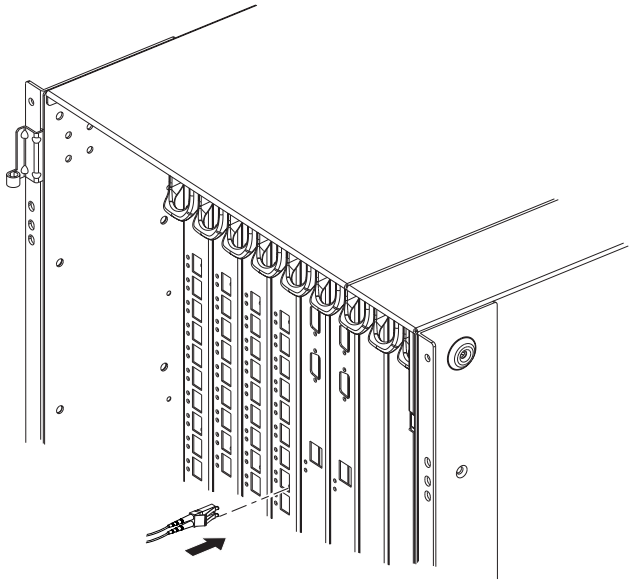


Figure 44: Replacing a fiber cable

4. Position the cable so that the key (the ridge on one side of the cable connector) is aligned with the slot in the transceiver, then insert into the transceiver until the latching mechanism clicks.

Note: Cables are keyed so that they can only be inserted with the correct orientation. If a cable does not slide in easily, ensure it is correctly oriented.

5. Repeat step 1 through step 4 for additional SFPs.

Cable Management Tray Summary

The cable management tray is attached to the bottom of the chassis, and routes the cables down below the chassis, or out the sides of the chassis.

Time and Items

Time and items required to replace the cable management tray include:

- Time required: Less than 5 minutes
- Items required: #2 Phillips screwdriver

Replacing the Cable Management Tray

Use this procedure to remove and install a cable management tray.

WARNING: Do not use a power screwdriver on the cable management tray.

1. Obtain a #2 Phillips head screwdriver.
2. Uninstall the current cable management tray, as follows.
   a. Pull any cables out of the tray.
   b. Unscrew the two screws holding the tray to the chassis, and put aside in a safe place.
   c. Rotate the front of the tray down, then lift the back to disengage the tabs on the back from the chassis.
3. Install the new cable management tray, as follows.
   a. Orient tray as shown in Figure 45, and insert the two tabs on underside of tray into the two slots at the bottom of the AC panel, then rotate front of tray upward until it locks into place.chassis.

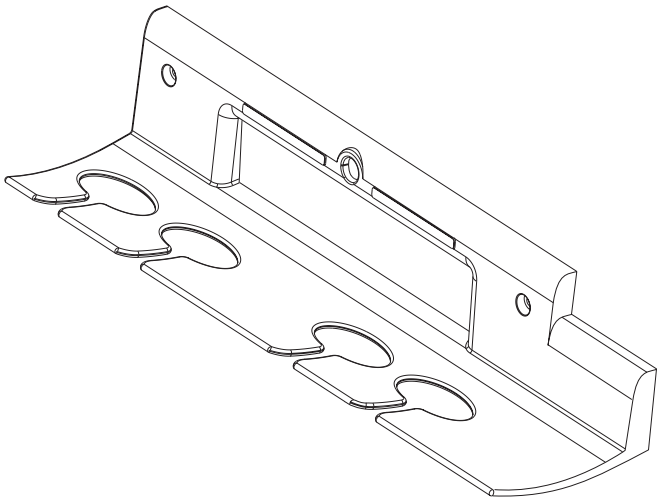


Figure 45: Cable management tray

b. Position and tighten the two screws removed in step 3a.

c. Arrange the cables through or along the tray as required.

Note: Routing the power cables out each side of the chassis is recommended.

Replacing the WWN Card

The WWN card is located on the non-port side of the chassis, underneath the WWN bezel.

Before replacing the WWN card, verify the necessity of the replacement with the switch support personnel. The Core Switch 2/64 WWN card is highly reliable and contains redundant components. In the unlikely event that the WWN card does fail, the Core Switch 2/64 can continue operating due to the high availability design until the WWN card is replaced, provided the Core Switch 2/64 does not go through a power cycle.

If a replacement WWN card is ordered, replacement instructions are provided with the new card.

Caution: If the WWN card fails, do not remove it until the replacement card has been received, and follow the instructions provided with the replacement.

For Fabric OS v4.0.2 and earlier, replacing the WWN card requires root access to the Core Switch 2/64. In addition, all software license keys must be replaced when a new WWN card is installed.

Note: There are two possible versions of the WWN card; one attaches to the chassis by screws, and the other is held onto the chassis by the pressure of the bezel against a pad on the card face.

WARNING: Do not reboot the switch while the WWN card is uninstalled, as this can cause the switch to boot incorrectly.

Caution: Wear a grounded ESD strap when handling a WWN card. A grounding connection is available on the chassis above the power connectors.

Replacing the Chassis

The Core Switch 2/64 chassis is highly reliable. Before replacing the chassis, verify the necessity of the replacement with the switch support personnel.

Replacing the chassis requires powering off the Core Switch 2/64, disconnecting all cables, and gaining root access to the Core Switch 2/64.

If a replacement chassis is ordered, replacement instructions are provided with the new card.

Caution: Disassembling any part of the chassis voids the part warranty and regulatory certifications. There are no user-serviceable parts inside the chassis.

Running Routine Operations

5

This chapter provides the following information:

Backing Up System Configuration Settings

Use these steps to upload a backup copy of the configuration settings to a host computer.

Note: The Core Switch 2/64 running Fabric OS V4.0 or later supports firmware backups and updates via FTP only.

1. Verify that the FTP service is running on the host workstation.
2. Log in to the switch as Admin.
3. Shut down the switch. At the command line, enter:

   ```
   switchdisable
   ```

4. At the command line, enter:

   ```
   configupload
   ```

5. Follow the onscreen prompts, for example:

   ```
   Server Name or IP Address [host]: 192.168.15.42
   User Name: [None} user21
   File Name [config.txt]: config-file.txt
   Password: xxxxxxxx
   ```

   The upload complete prompt displays, indicating a successful backup.

Restoring the System Configuration Settings

Use these steps to restore the configuration settings from a backup.

Note: The Core Switch 2/64 running Fabric OS V4.0 or later supports firmware backups and updates via FTP only.

1. Verify that the FTP service is running on the host workstation.
2. Login to the switch as the admin user.
3. Shut down the switch. At the command line, enter:

   ```
   switchdisable
   ```

4. At the command line, enter:

   ```
   configdownload
   ```

5. Follow the onscreen prompts, for example:

   ```
   Server Name or IP Address [host]: 192.168.15.42
   User Name: [None} user21
   File Name [config.txt]: config-file.txt
   Password: xxxxxxxx
   ```

   The download complete prompt displays, indicating a successful download.

6. Reboot the switch. At the command line, enter:

   ```
   reboot
   ```

Upgrading Firmware

Use the following procedure to upgrade Core Switch 2/64 firmware.

1. This command upgrades both CPs in the switch. If you what to upgrade a single CP only, please use -s option. This command causes the active CP to reset. This causes disruption to devices attached to both switch 0 and switch 1 momentarily and requires that existing telnet sessions be restarted.

```
firmwaredownload

option=0

Do you want to continue [Y]: y

Server Name or IP Address:

User Name:

File Name:

Password:

FirmwareDownload has started on Standby CP. It may take up to 10
minutes.

FirmwareDownload has completed successfully on Standby CP.

Standby CP reboots.

Standby CP boots up.

Standby CP booted up with new firmware.
```

You can run `firmwareDownloadStatus` from a telnet session to get the status of this command.

Note: It is highly recommended that the same firmware version is running on both CP cards (CP0 in slot 5 and CP1 in slot 6).

Verifying Optional Software Licenses

Use these steps to display optional features installed on your switch.

1. Login to the switch as the `admin` user.
2. At the command line enter:

   ```
   licenseShow
   ```

   This command displays the license keys that have been entered for the switch and the features enabled by those licenses.

Enabling Licensed Features

Licensed features such as Fabric Watch are already loaded onto the switch firmware, but must be enabled with a license key. Once you have purchased these features you are provided with a key to unlock the feature.

Refer to the *HP StorageWorks Core Switch 2/64 Version 4.1 Release Notes* to determine which features require purchasing a license key for activation.

Uses these steps to enable a licensed feature.

1. Login to the switch as the admin user.
2. At the command line enter the following command:

   ```
   licenseAdd "aaaBbbCcc"
   ```

   aaaBbbCcc is the license key for a particular feature.

Note: You must enter a license key for each feature to activate. License keys are case sensitive.

Technical Specifications

This appendix describes the Core Switch 2/64 technical specifications, including:

Core Switch 2/64 Components

The Core Switch 2/64 consists of the following components:

- A 14U chassis, designed to be mounted in a standard 19-inch rack. Up to two Core Switch 2/64 switches may be mounted in a standard 42U rack.
- Port cards in configurations of 2, 4, or 8 cards per chassis, with:
  - 16 optical or copper ports per card, compatible with SFPs (small form factor pluggable media)
- Two CP cards, each with:
  - One modem serial port (labeled RS -232) with a DB-9 connector (full RS-232)
  - One terminal serial port (labeled 10101) with a DB-9 connector (RS-232 signal subset)
  - One IEEE compliant RJ-45 connector for use with a 10/100 Mbps ethernet connection
  - A real-time clock (RTC) with a 10-year battery
- Four power supplies with built-in fans. The power supplies plug into internal blind-mate connectors when installed in the chassis.
- Two AC power inlet connectors with AC power switches (power panel). Some chassis have a housing over the AC switches to prevent them from being accidentally powered off.
- A WWN card and bezel. There are two versions of the WWN card; one is attached to the chassis by screws and the other version is held on by the pressure applied by the bezel against the pad on the card face.
- Three blower assemblies for forced-air cooling that flows from the blower side of the chassis to the port side of the chassis. The fans provide adequate cooling for the maximum switch power rating of 102 Watts.

Refer to the illustrations in the section Operating the Core Switch 2/64, on page 89.

System Specifications

Table 13 lists system specifications for the Core Switch 2/64.

Table 13: Core Switch 2/64 System Specification

Specification	Description
Configurable Port Types	F_Port, FL_Port, and E_Port connections
EMI Rating	The Core Switch 2/64 conforms to the Electromagnetic Interference (EMI) radiation levels specified by the following regulations: FCC Rules & Regulations, Part 15B, Class A level CISPR22 Class A EN55022 Class A VCCI Class A ITE AS/NZS 3548 Class A CNS13438 Class A ICES-003 Class A
System Architecture	Non-blocking shared-memory
System Processor	IBM Power PC 405GP, 200 MHz CPU
ANSI Fibre Channel Protocol	Fibre Channel Physical and Signalling Interface (FC-PH)
Modes of Operation	Fibre Channel Class 2 and Class 3
Fabric Initialization	Complies with FC-SW 5.0
FC-IP (IP over Fibre Channel)	Complies with FC-IP 2.3 of the FCA profile
Aggregate I/O Bandwidth	Per port: 4 Gbps, running at 2 Gbps, full duplex per 16-port card: 64 Gbps, all 16 ports at 2Gbps, full duplex
Port-to-Port Latency	Less than 2 microseconds with no contention (destination port is free)

Table 13: Core Switch 2/64 System Specification (Continued)

Specification	Description
Routing Capacity	A minimum aggregate routing capacity of four million frames per second is provided for Class 2, Class 3, and Class F frames in a 64-port switch.
Data Transmission Range	Up to 500 m (1,625 ft.) for short-wavelength optical link Up to 10 km (32,820 ft.) for long-wavelength optical link
Immunity	IEC 61000-4-2 Severity Level 3 for Electrostatic Discharge IEC 61000-4-3 Severity Level 3 for Radiated Fields IEC 61000-4-4 Severity Level 3 for Fast Transients IEC 61000-4-5 Severity Level 3 for Surge Voltage IEC 61000-4-6 Conducted Emissions IEC 61000-4-11 Voltage Variations

Dimensions

Table 14 lists physical specifications for the Core Switch 2/64.

Table 14: Physical Specifications

Dimension	Value
Height	14U or 24.11 inches
Depth	27.9 inches (70.9 cm)
Depth with Door	28.7 inches (72.9 cm)
Width	17.2 inches (43.7 cm)

System Weight

Table 15 lists weight specifications for the Core Switch 2/64.

Table 15: Component Weight

Component	Value
Fully Loaded Chassis	248 lbs (113 kg)
Empty Chassis	104 lbs (47.1 kg)
Door	7.6 lbs (3.4 kg)
Blower Assembly	8.8 lbs (4 kg)
Power Supply	7.0 lbs (3.2 kg)
WWN Bezel	0.6 lbs (0.27 kg)
CP card	5.6 lbs (2.5 kg)
16-port card	8.6 lbs (3.9 kg)
Card Filler Panel	3.2 lbs (1.6 kg)
Cable Management Tray	0.6 lbs (0.27 kg)

Facility Requirements

The facility where the Core Switch 2/64 is in use must meet the following requirements to provide for correct operation:

- Power requirements for a physical inlet:
  - Input Power Requirements: 200-240 VAC, 12A, 50-60 Hz
  - Recommended Power Connector: IEC 320, EN60320 C19-Angled, 16A/250VAC
- Adequate supply circuit, line fusing, and wire size, as specified by the electrical rating on the chassis nameplate.
- An air flow of at least 350 cubic feet per minute, available in the immediate vicinity of the Core Switch 2/64.
- The power specifications listed in Table 16, page 176.
- The environmental specifications listed in Table 17, page 177.
- The electrical interference must be less than the levels stated in the standards listed in the Immunity row in Table 13, page 171.
- If the Core Switch 2/64 will be installed in an EIA rack:
  - Ensure that all equipment installed in the rack has a reliable branch circuit ground connection, and does not rely on a connection to a branch circuit, such as a power strip.
  - Ensure that the rack is balanced and mechanically secured to ensure stability in the event of an earthquake.
  - Verify that the additional equipment does not exceed the rack's weight limits.

Power Specifications

The power supplies are universal and capable of functioning worldwide without using voltage jumpers or switches. They meet IEC 61000-4-5 surge voltage requirements and are autoranging. Each power supply has its own built-in fan for cooling, pushing the air towards the port side of the chassis.

Table 16 specifications represent fully loaded systems. A fully loaded Core Switch 2/64 contains two CP cards, eight 16-port cards, three blower assemblies, and four power supplies.

WARNING: You must disconnect both power cables when removing power to the Core Switch 2/64.

Table 16: Power Specifications

Specification	Value
Power Receptacle	IEC 320, EN60320, C20, 16A/250VAC
Total Power Available from each Power Supply	1 KW
Input Voltage	200 - 240 VAC. System can operate with any of three phases of a 3-phase or single-phase power utility.
Input Line Frequency	50 - 60 Hz
Harmonic Distortion	Active power factor correction per IEC1000-3-2
Heat Output (BTU rating)	64 ports: maximum1080 Watts, 3690 BTU/hr 128 ports: maximum 1960 Watts, 6700 BTU/hr
Maximum Inrush Current Per Power Cord	40 Amps Peak, 1/2 cycle
Input Line Protection	Thermal circuit breaker

Environmental Requirements

Table 17 lists the environmental operating ranges for the Core Switch 2/64. The requirements for nonoperating conditions are also provided.

Table 17: Environmental Requirements

Condition	Acceptable Range During Operation	Acceptable Range During Non-Operation
Ambient Temperature	0° to 40° Celsius outside switch (50° to 104° Farenheit)	-25° to +70° Celsius outside switch (-13° to 158° Farenheit)
Humidity	20% to 85% RH non-condensing, at 40× Celsius, with maximum gradient of 10% per hour	10% to 85% RH non-condensing, at 70° Celsius
Altitude	0 to 3 kilometers above sea level (0 to 10,000 feet altitude)	0 to 12 kilometers above sea level (0 to 39,370 feet)
Shock	4G, 11MS duration, half-sine wave	20G, 11MS duration, sq. wave
Vibration	5G, 0-3 kHz at 1.0 octave/minute	10G, 0-5 kHz at 1.0 octave/minute
Heat Dissipation	64 ports: 3690 BTU/hr 128 ports: 6700 BTU/hr	Not applicable

Note: The 0° – 40° C temperature range listed in Table 17 represents the ambient temperature at the air intake vents on the non-port side of the switch. Individual components may have a higher range. For example, the 16-port cards and CP cards have a temperature range up to 75° C. Use the `tempShow` command to show the true temperature of each individual component.

Data Transmission Ranges

Table 18 displays the data transmission ranges for different cable types and port speeds.

Table 18: Laser Data Transmission Range

Port Speed	Cable Size (microns)	Short Wavelength	Long Wavelength
1 Gbps	50	1,640 feet (500 meters)	N/A
1 Gbps	62.5	984 feet (300 meters)	N/A
1 Gbps	9	N/A	6.2 miles (10 km)
2 Gbps	50	984 feet (300 meters)	N/A
2 Gbps	62.5	492 feet (150 meters)	N/A
2 Gbps	9	N/A	10 km (6.2 miles) without an Extended Fabrics license; 50 to 100 km with an Extended Fabrics license.

Port Card Specifications

Port card specifications only include specifications for the Fibre Channel ports.

Fibre Channel Port Specifications

The Fibre Channel ports in the Core Switch 2/64 support full duplex link speeds at 2.125 or 1.0625 Gbps inbound and outbound, automatically negotiating to the highest common speed of all devices connected to the port. Each port has a SerDes (serializer/deserializer) which accepts 10-bit wide parallel data and serializes it into a high-speed serial stream. The parallel data is expected to be **8B/10B** encoded data or equivalent.

The ports are compatible with optical SWL (short wave-length: 780-850 nm) and optical LWL (long wave-length: 1270-1350 nm) SFPs (small form factor pluggable media) and SFP-compatible cables. The strength of the signal is determined by the type of SFP in use.

Memory Specifications

Each CP card contains the following memory:

- Main memory: 256 MB SDRAM (32 Bits wide)
- Flash memory:
  - User flash: 16MB of 16-bit wide memory, stored in two 8MB banks
  - Compact flash: 256MB, partitioned in two 128MB sections
- Boot flash: 512K bytes of 8-bit for system boot

Note: The centralized memory maximizes the overall switch throughput by guaranteeing full transmit and receive bandwidth to all Fibre Channel ports at all times.

The CP card operates with a lithium carbon-monoflouride coin cell battery. The battery type and specifications are listed next:

- Rayovac BR 1225
- 3.0 volt, 50 mAh

WARNING: There is danger of explosion if the battery is incorrectly replaced. Discard all used batteries according to the manufacturer's instructions. Contact your Core Switch 2/64 supplier if the real time clock begins to lose time.

Each CP card contains a serial port with a DB-9 connector, and an RS-232 signal subset.

Note: A serial port cover is included with the switch to prevent dust and electrostatic discharge (ESD) particles from entering the port. When the serial port is not in use, make sure to replace the serial port cover. The terminal serial port is intended primarily for use during the initial setting of the IP address and for service purposes.

Use the serial port to connect to a computer workstation or terminal without connecting to the fabric. Configure the terminal device using these settings:

- 9600 baud
- 8 data bits, no parity
- 1 stop bit
- no flow control

A 10 ft. (3.0m) serial cable is provided with the switch; it can be converted from a DB-9 serial cable to an RJ-45-style serial cable by removing the adapter on the end of the cable.

The serial port requires a straight through serial cable with a female 9-pin D-SUB connector. Table 19 lists serial port pin outs.

Table 19: Serial Port Pin Outs

PIN	Signal	Description
1		
2	TxData	Transmit Data
3	RxData	Receive Data
4		
5	GND	Logic Ground
6		
7		
8		
9		

Each CP card contains a modem serial port with a fully RS-232 compliant DB-9 connector.

Note: A port cover is included with the switch to prevent dust and electrostatic discharge (ESD) particles from entering the modem serial port. When the modem serial port is not in use, make sure to replace the port cover.

Note: The modem port can be used for attaching a modem to each CP card. The Core Switch 2/64 detects modems only during the power-on or reboot sequences, and automatically initializes them for operation. If modems are connected to an operating switch, a power on/off cycle, reboot, or fast reboot is required in order to detect the modem(s).

Connect a Y cable on the telephone line to each modem The active CP card answers on the first ring. If the active CP card fails to answer, the standby CP card answers on the 7th ring.

Table 20: Modem Serial Port in Outs

PIN	Signal	Description
1	DCD	Data Carrier Detect
2	RxData	Receive Data
3	TxData	Transmit Data
4	DTR	Data Term Ready
5	GND	Logic Ground
6	DSR	Data Set Ready
7	RTS	Request to Send
8	CTS	Clear to Send
9	RI	Ring Indicator

POST and Boot Specifications

The Core Switch 2/64 performs POST by default each time the chassis is powered on (“cold boot”) or the Core Switch 2/64 is rebooted or reset. The Core Switch 2/64 can be rebooted using the `switchreboot`, `reboot`, or `fastboot` commands. The `fastboot` command reboots the switches without running POST. If the active CP card is rebooted, it fails over to the other CP card.

POST

The success/fail results of the diagnostic tests that run during POST can be monitored through LED activity, the error log, or a command-line interface. POST requires a minimum of three minutes to complete (time may vary depending on devices connected to Core Switch 2/64).

POST includes the following steps:

1. Preliminary POST diagnostics are run.
2. Operating system is initialized.
3. Hardware is initialized.
4. Diagnostic tests are run on several functions, including circuitry, port functionality, ability to send and receive frames, all aspects of memory, parity, statistics counters, and serialization.

Boot

Boot completes in a minimum of three minutes if POST is run.

In addition to POST, boot includes the following steps after POST is complete:

1. Universal port configuration is performed.
2. Links are initialized.
3. Fabric is analyzed. If any ports are connected to other switches, the switch participates in a fabric configuration.
4. The switch obtains a domain ID and assigns port addresses.
5. Unicast routing tables are constructed.
6. Normal port operation is enabled.

Extensive Information on the PID Format

This section provides best practices for updating an existing production SAN to the new PID format. In addition to the core PID format update process, there are a number of very common scenarios in which a device may be assigned a new PID. Therefore the procedures included in this section are applicable to other areas of SAN administration, and should be generally useful to any SAN administrator.

A Port Identifier (PID) is one of two addressing mechanisms used in Fibre Channel. This is analogous to specifying the physical switch and port a device is attached to in data networks. It is not analogous to an IP address. There are numerous situations in which a device's PID may change. PIDs are assigned by a Fibre Channel switch when a device logs into the fabric. For example, a PID would be:

```
011F00
```

The other Fibre Channel addressing mechanism is the World Wide Name (WWN).

This is analogous to an Ethernet MAC address. A device's WWN never changes. WWNs are assigned by the factory when a device is manufactured, as shown in the following example:

```
10:00:00:60:69:51:0e:8b
```

The method switches use for assigning PIDs has changed between the 16-port switches and the larger port count products. The old PID format was XX*1*YZZ, *Y* was a hexadecimal number which specified a particular port on a switch and *1* was a constant.

(The use of the constant was based on an overly conservative reading of the Fibre Channel standards.) XX was used for the domain ID and ZZ for the AL_PA. Since all switches had sixteen or fewer ports at the time that method was established, one hexadecimal digit was entirely adequate.

The new format is XX*YY*ZZ. *YY* represents a port.Using the entire middle byte for the port allows addressing up to 256 ports per switch. This change was necessary to support products with more than sixteen ports. When a switch with the new core PID format is introduced into an existing fabric, the core PID format needs to be set on all switches in the fabric to prevent segmentation.

To make this change, it is necessary to schedule an outage for the fabric. This does not require application downtime, if redundant fabrics are used. If redundant fabrics are not used, there are numerous failure cases and even routine maintenance scenarios which result in application downtime. This is true for any currently available Fibre Channel technology.

In new installations, the PID format should always be set to the new addressing method before the fabric enters production. When updating an existing SAN, there are several scenarios which must be evaluated before changing the PID format.

Proactively setting the core PID format on all new fabrics before they enter production will prevent the need to update those fabrics in the future. This is strongly recommended as a step in the deployment of all new fabrics. There is no difference in the behavior of a fabric with either PID format; changing to the new format during deployment will merely save administrative effort later on.

Some device drivers map logical disk drives to physical Fibre Channel counterparts by PID.

An example in a Windows HBA driver is:

```
Drive E: = PID 011F00
```

Most drivers can either dynamically change PID mappings or use the WWN of the Fibre Channel disk for mapping, not the PID, as shown in the following example:

```
Drive E: = WWN 10:00:00:60:69:51:0e:8b
```

For those few drivers that use static PID binding, when the format is changed (PID à 010F00), the mapping breaks and must be manually fixed. (The driver still has “Drive E: = PID 011F00” but the actual device address is now “010F00”) This can be done by rebooting the host, or using a manual update procedure on the host. This is discussed in more detail in the following sections.

In the more typical case where WWN or dynamic PID binding is used changing the device's PID does not affect the mapping, but before updating the PID format, it is necessary to determine whether or not any devices in the SAN bind by PID.

In every case where devices bind by PID, any such procedure will become difficult or impossible to execute without downtime. In some cases, device drivers allow the user to manually specify persistent bindings by PID. In these cases, such devices must be identified and an appropriate update procedure created. If possible, the procedure should involve changing from PID binding to WWN binding. The Recommended Approaches section of this section discusses in more detail the process of updating to the new PID format. This starts with evaluating a production SAN to see which if any devices bind by PID. Then either an online or offline update procedure will be chosen to perform the actual update.

The Frequently Asked Questions section provides a Q&A format to discuss the issues surrounding a core PID format update. Finally, the Detailed Procedures section provides examples of step-by-step instructions for certain PID-bound

devices. These procedures are applicable to any of a broad class of routine maintenance tasks; indeed, they would apply to these devices in many scenarios with any Fibre Channel switch in any addressing mode.

While this section is not comprehensive, it should give a SAN administrator the information needed to plan and execute a successful core PID format update, and also provide useful information for other SAN management tasks.

Recommended Approaches

To update to the new PID format in a non-production or non-critical environment, the procedure can be very simple. Schedule downtime for all devices attached to the SAN, and perform the offline update procedure below. This is the easiest process, but the most disruptive to the environment.

The process of updating to the new PID format online in a production environment is slightly more complex. It is broken down into two phases: the evaluation phase and the update phase. At the end of the evaluation phase, all information needed to safely update to the new PID format will be in hand, and an update procedure will be created. Depending on the results of the evaluation phase and the SAN's uptime requirements, either the online or offline update processes will be used in the update phase.

Evaluation Phase

In this phase, the SAN will be evaluated to determine how each device driver responds to the PID format change, and how the SAN's multi-pathing software responds to a fabric service interruption.

Data Collection

In many sites, detailed documentation about the SAN is kept up-to-date. If so, it may be possible to skip the Data Collection step. However, some sites will not already have this information at hand. In these cases, it is necessary to perform a site survey, collecting information on each device in the SAN. The purpose is to find any devices which bind to PIDs, and find out how the multi-pathing software will respond to the process. Learning this will have broad applicability:

PID-bound devices are not able to seamlessly perform in many routine maintenance or failure scenarios, and improperly configured multi-pathing software may cause downtime, rather than avoiding it.

Any kind of device could bind by PID. While the vast majority of devices do not do so, each device should be evaluated prior to attempting an online update.

This is a non-comprehensive list of information to collect, which would be both generally useful and relevant to the PID update process:

- HBA driver versions
- Fabric OS versions
- RAID array microcode versions
- SCSI bridge code versions
- JBOD drive firmware versions
- Multi-pathing software versions
- HBA time-out values
- Multi-pathing software time-out values
- Kernel time-out values

In addition to looking for information about the code revisions in use, look at the way each device is used. Some device drivers do not automatically bind by PID, but allow the operator to manually create a PID binding. For example, persistent binding of PIDs to logical drives may be done in many HBA drivers. Make a list of all devices which are configured this way. If manual PID binding has been done, consider changing to WWN binding.

This is a non-comprehensive list of device types which may be manually configured to bind by PID:

- HBA drivers (persistent binding)
- RAID arrays (LUN access control)
- SCSI bridges (LUN mapping)

Data Analysis

Once you have collected the code versions of each device on the SAN, they must be evaluated to find out if any of them automatically bind by PID. Do this in cooperation with the support providers for each device on the SAN.

Some providers may simply be able to answer this question; in other cases, it may be necessary to perform empirical testing. Most devices do not bind by PID when running up-to-date drivers. However, some older driver versions may behave this

way. Whenever possible, HP recommends using up-to-date drivers that do not bind by PID, as binding by PID creates management difficulty in a number of scenarios.

The drivers shipping by default with HP/UX and AIX at the time of this writing still bind by PID, and so detailed procedures are provided for these operating systems in the final section of this overview. Similar procedures can be developed for other operating systems which run HBA drivers that bind by PID. HP recommends upgrading to WWN-binding drivers if these are available.

There is no inherent PID binding problem with either AIX or HP/UX. It is the HBA drivers shipping with these operating systems that bind by PID. Both OSs are expected to release HBA drivers that bind by WWN, and these may already be available through some support channels. Work with the appropriate support provider to get more information about driver availability.

Also evaluate whether or not devices which are manually bound by PID can be migrated to WWN binding. If not, determine what procedures will be required to change their bindings.

It is also important to understand how multi-pathing software will react when one of the two fabrics is taken offline. If the time-outs are set correctly, then switchover between fabrics should be transparent to the users of the system.

Empirical Testing

For some devices, it may not be possible to determine whether or not they bind by PID by asking the support provider. In these cases, empirical testing is recommended. If you are not sure about a device, work with the support provider to create a test environment.

Create as close a match as practical between the test environment and the production environment, and perform an update using the Online Update procedure. Devices that bind by PID are unable to adapt to the new format, and one of three approaches can be taken with them:

- Create a plan can for working around the device driver's limitations in such a way as to allow an online update. See the section Detailed Procedures, on page 193 for examples.
- Upgrade the device drivers to drivers that do not bind by PID.
- Schedule downtime to reset the device during the core PID update process, which generally allows the mapping to be rebuilt.

If you use one of the first two options, the procedures should again be validated in the test environment. Some multipathing software installations handle fabric failover gracefully and quickly. There are quite a few variables which affect this, including but not limited to:

- HBA time-out values
- Multipathing software time-out values
- Kernel time-out values

If the behavior of multi-pathing software in the SAN is not well understood, a test should be run to determine this as well. For installations where the multi-pathing software does handle switchover automatically and seamlessly, the update process is greatly simplified.

Update Plan Creation

The specific procedures used to update to the new PID format varies on a site-by-site basis. However, there are general guidelines for the update process options. These guidelines are provided to give SAN administrators a starting point for creating site-specific procedures, not to be the complete procedures themselves.

The online update process is only intended for use in uptime-critical dual-fabric environments, with multi-pathing software. If dual-fabrics are not in place, there are a number of routine maintenance scenarios which require scheduled downtime, the core PID migration process being only one example. High-uptime environments should always use a redundant fabric SAN architecture.

Online Update Plans

The general format for an online update plan is as follows:

1. Backup all data. Verify backups.
2. Verify that I/O continues over the other fabric.
3. Disable all switches one at a time in the fabric to be updated.
4. Verify that I/O continues over the other fabric after each switch disable.
5. Change the PID format on each switch in the fabric as described in the section Detailed Procedures on page 191.
6. One at a time, reenable the switches in the updated fabric.
7. In a core/edge network, enable the core switches first.

8. Once the fabric has reconverged, use the `cfgenable` command to update zoning.

- For any devices manually bound by PID, update their bindings. This may involve changing them to the new PIDs, or may (preferably) involve changing to WWN binding.
- For any devices automatically bound by PID, two options exist:
  - — Execute a custom procedure to rebuild its device tree online. Examples are given in the Detailed Procedures section of this *readme.txt*. Reboot the device to rebuild the device tree.
  - — Some operating systems require a special command to do this, for example, `boot -r` command in Sun Solaris systems. For devices that do not bind by PID or have had their PID binding updated, mark online or re-associate the disk devices with the multipathing software and resume I/O over the updated fabric.

    Repeat with the other fabrics.

Offline Update Plans

The general format for an offline update plan is as follows:

1. Backup all data.
2. Verify backups.
3. Shut down all hosts and storage devices attached to the SAN.
4. Disable all switches in the fabric to be updated.
5. Change the PID format on each switch in the fabric.
6. One at a time, reenable the switches in the updated fabric.

   In a core/edge network, enable the core switches first.
7. Once the fabric has re-converged, use the cfgEnable command to update zoning.

Repeat step 3 through step 6 for all fabrics in the SAN.

Bringing Devices Online

- Bring the devices online in the order appropriate to the SAN. This usually involves starting up the storage arrays first, and the hosts last.
- For any devices manually bound by PID, bring the device back online, but do not start applications. Update their bindings and reboot again if necessary. This may involve changing them to the new PIDs, or may (preferably) involve changing to WWN binding.
- For any devices automatically bound by PID, reboot the device to rebuild the device tree. (Some operating systems require a special command to do this, for example, `boot -r` command in Sun Solaris systems)
- For devices that do not bind by PID or have had their PID binding updated, bring them back up and resume I/O.
  - — Verify that all I/O has resumed correctly.
  - — Migrating from manual PID binding (such as persistent binding on an HBA) to manual WWN binding and/or upgrading drivers to versions that do not bind by PID can often be done before setting the core PID format. This can be advantageous, as it prevents the update process from having as many variables.

Update Phase

This section includes the update information:

Online Update

Provided that careful planning, testing, and general due-diligence has been performed, it should be safe to update the core PID format parameter in a live, production environment.This requires dual fabrics with multi-pathing software.

Create a detailed update plan. Guidelines are provided above. Schedule a time for the update when the least critical traffic is running. This is a best practice for any kind of online add, move, change, upgrade, or update. At very least, it is a good

idea to avoid running backups during the update process, as tape drives tend to be very sensitive to I/O interruption. Backup all data with verification, then update one fabric at a time, verifying I/O at each step in the process.

Offline Update

It is possible to execute an offline update with less advance planning. However, it requires that all devices attached to the fabric be offline.

Which option to choose depends on the uptime requirements of the site. High uptime sites should all have dual fabrics with multi-pathing software, so the online update is an option for those SANs. Single fabric sites must use offline procedures.

Create an update plan. Guidelines are provided above. Schedule an outage for all devices attached to the SAN. Backup all data with verification, then update all fabrics in the SAN at the same time. Bring all devices back online, and verify I/O.

Hybrid Update

It is possible to combine the online and offline methods for fabrics where only a few devices bind by PID. Since any hybrid procedure will be extremely customized, it is necessary to work closely with the SAN service provider in these cases.

PID Frequently Asked Questions

Q: What is a PID?

A: A PID is a Port Identifier. PIDs are used by the routing and zoning services in Fibre Channel fabrics to identify ports in the network. They are not used to uniquely identify a device; the World Wide Name (WWN) does that.

Q: What situations can cause a PID to change?

A: Many scenarios cause a device to receive a new PID. For example, unplugging the device from one port and plugging it into a different port will cause this. (This might happen when cabling around a bad port, or when moving equipment around.) Another example is changing the domain ID of a switch, which might be necessary when merging fabrics, or changing compatibility mode settings.

Q: Why do some devices handle a PID change well, and some poorly?

A: Some older device drivers behave as if a PID uniquely identifies a device. These device drivers should be updated if possible to use WWN binding instead. A device's WWN never changes, unlike its PID. PID binding creates problems in

many routine maintenance scenarios, and should always be avoided. Fortunately, very few device drivers still behave this way, and these are expected to be updated as well.

Q: Must I schedule downtime for my SAN to perform the PID update?

A: Generally, no. Provided that you have dual-fabrics and are certain that no devices in your SAN bind by PID, the update process is simple and user-transparent. It is necessary to spend some effort to ensure this before attempting an online update, and if the effort is less attractive than the downtime, you may prefer to schedule an outage.

Q: Must I stop all traffic on the SAN before performing the update?

A: If you are running dual-fabrics with multi-pathing software, you can update one fabric at a time. Move all traffic onto one fabric in the SAN, update the other fabric, move the traffic onto the updated fabric, and update the final fabric. Without dual-fabrics, stopping traffic is highly recommended. This is the case for many routine maintenance situations, so dual-fabrics are always recommended for uptime-sensitive environments.

Q: How can I avoid having to change PID formats on fabrics in the future?

A: The core PID format can be proactively set on a fabric at initial installation. The update could also be opportunistically combined with any scheduled outage. Setting the format proactively far in advance of adoption of higher port count switches is the best way to ensure administrative ease.

Q: Where can I get more information on upgrading to larger switches?

A: Refer to the SAN Design Guide and HP support.

Detailed Procedures

These procedures are not intended to be comprehensive. They provide a starting point from which a SAN administrator could develop a site-specific procedure for a device that binds automatically by PID, and cannot be rebooted due to uptime requirements.

HP/UX

1. Back up all data. Verify backups.
2. If you are not using multipathing software, stop all I/O going to all volumes connected through the switch/fabric to be updated.

3. If you are not using multipathing software, unmount the volumes from their mount points using the `umount` command as shown in the following example:

   ```
   umount /mnt/jbod
   ```

4. If you are using multipathing software, use that software to remove one fabric's devices from its configuration.
5. Deactivate the appropriate volume groups using the `vgchange` command with the following syntax:

   ```
   vgchange -a n <path to volume group>.
   ```

6. For example:

   ```
   vgchange -a n /dev/jbod
   ```

7. Make a backup copy of the volume group directory using the `tar` command from within /dev. For example:

   ```
   tar -cf /tmp/jbod.tar jbod
   ```

8. Export the volume group using the `vgexport command` with the following syntax:

   ```
   vgexport -m <map file> <path to volume group>
   ```

   For example:

   ```
   vgexport -m /tmp/jbod_map /dev/jbod
   ```

9. Login into each switch in the fabric.
10. Issue the `switchDisable` command.
11. Issue the `configure` command and change the Core Switch PID Format to **1**.
12. Issue the command switchEnable. Enable the core switches first, then the edges.
13. Once you have done this to all switches in the fabric and verified that it has reconverged properly, issue the `cfgEnable` command on one of the switches in that fabric, as shown in the following example:

    ```
    cfgEnable my_zones
    ```

14. Clean the *lvmtab* file by using the `vgscan` command.
15. Change to /dev and untar the file that was tarred in step 5. For example:

    ```
    tar -xf /tmp/jbod.tar
    ```

16. Import the volume groups using the `vgimport` command with the following syntax:

    ```
    vgimport -m <map file> <path to volume group> <physical volume path>
    ```

    For example:

    ```
    vgimport -m /tmp/jbod_map /dev/jbod /dev/dsk/c64t8d0 /dev/dsk/c64t9d0
    ```

17. Activate the volume groups using `vgchange` command with the following syntax:

    ```
    vgchange -a y <path to the volume group>
    ```

    For example:

    ```
    vgexport -a y /dev/jbod
    ```

18. If you are not using multipathing software, mount all devices again and restart I/O. For example:

    ```
    mount /mnt/jbod
    ```

Note: If you are using multipathing software, re-enable the affected path. The preceding steps do not "clean up" the results from ioscan. When viewing the output of ioscan, notice that the original entry is still there, but now has a status of NO_HW.

```
# ioscan -funC disk
Class  I H/W Path         Driver S/W State  H/W Type
Description
disk  0 0/0/1/1.2.0       adisk CLAIMED   DEVICE      SEAGATE
ST39204LC
                  /dev/dsk/c1t2d0  /dev/rdsk/c1t2d0
disk  1 0/0/2/1.2.0      adisk CLAIMED   DEVICE      HP DVD-ROM
304
                  /dev/dsk/c3t2d0  /dev/rdsk/c3t2d
disk 319 0/4/0/0.1.2.255.14.8.0  adisk CLAIMED   DEVICE
SEAGATE ST336605FC
/dev/dsk/c64t8d0 /dev/rdsk/c64t8d0
disk 320 0/4/0/0.1.18.255.14.8.0 adisk NO_HW    DEVICE
SEAGATE ST336605FC
/dev/dsk/c65t8d0 /dev/rdsk/c65t8d0
```

19. To remove the original (outdated) entry, use the `rmsf` (remove special file) command using the following syntax:

    ```
    rmsf -a -v <path to device>
    ```

    For example:

    ```
    rmsf -a -v /dev/dsk/c65t8d0
    ```

20. Validate that the entry is removed by using the `ioscan -funC disk command.` Notice in the following example that the **NO_HW** entry is no longer listed.

    ```
    het46 (HP-50001)> ioscan -funC disk
    Class  I H/W Path        Driver S/W State H/W Type
    Description
    disk  0 0/0/1/1.2.0       adisk CLAIMED   DEVICE      SEAGATE
    ST39204LC
                      /dev/dsk/clt2d0  /dev/rdsk/c1t2d0
    disk  1 0/0/2/1.2.0       adisk CLAIMED   DEVICE      HP DVD-ROM
    304
                      /dev/dsk/c3t2d0  /dev/rdsk/c3t2d0
    disk 319 0/4/0/0.1.2.255.14.8.0 adisk CLAIMED   DEVICE
    SEAGATE ST336605FC
    /dev/dsk/c64t8d0 /dev/rdsk/c64t8d0
    ```

21. Repeat for all fabrics.

IBM AIX Procedure

1. Back up all data. Verify backups.
2. If you are not using multi-pathing software, stop all I/O going to all volumes connected through the switch or fabric to be updated.
3. If you are not using multipathing software, `varyoff` the volume groups using the following syntax:

    ```
    varyoffvg <volume_group_name>
    ```

    For example:

    ```
    varyoffvg datavg
    ```

4. If you are not using multipathing software, unmount the volumes from their mount points using the `umount` command and the following syntax:

   ```
   umount <mount_point>
   ```

   For example:

   ```
   umount /mnt/jbod
   ```

5. If you are using multipathing software, use that software to remove one fabric's devices from its configuration.
6. Remove the device entries for the fabric you are migrating. For example, if the HBA for that fabric is **fcs0**, enter:

   ```
   rmdev -Rdl fcs0
   ```

7. Login into each switch in the fabric.
8. Issue the `switchDisable` command.
9. Issue the `configure` command and change the Core Switch PID Format to **1**.
10. Issue the `configenable` (effective_zone_configuration) command. For example:

    ```
    configenable my_config
    ```

11. Issue the `switchEnable` command. Enable the core switches first, then the edges.
12. Rebuild the device entries for the affected fabric using the `cfgmgr` command. For example:

    ```
    cfgmgr -v
    ```

    This command may take several minutes to complete.

    If you are not using multipathing software, enter the `varyonvg` command to vary on the disk volume groups, using the following syntax:

    ```
    varyonvg <volume_group_name>
    ```

    For example:

    ```
    varyonvg datavg
    ```

13. If you are not using multipathing software, mount all devices again and restart I/O.For example:

    ```
    mount /mnt/jbod
    ```

14. If you are using multipathing software, reenable the affected path.
15. Repeat for all fabrics.

Regulatory Compliance Notices

B

This appendix includes the following regulatory compliance information:

Regulatory Compliance Identification Numbers

For the purpose of regulatory compliance certifications and identification, your HP StorageWorks Core Switch 2/64 is assigned a series number. The series number for this product is: Series NA2108. The series number can be found on the product label, along with the required approval markings and information. When requesting certification information for this product, always refer to this series number. This series number should not be confused with the marketing name or model number for your Core Switch 2/64.

Federal Communications Commission Notice

Part 15 of the Federal Communications Commission (FCC) Rules and Regulations has established Radio Frequency (RF) emission limits to provide an interference-free radio frequency spectrum. Many electronic devices, including computers, generate RF energy incidental to their intended function and are, therefore, covered by these rules. These rules place computers and related peripheral devices into two classes, A and B, depending upon their intended installation. Class A devices are those that may reasonably be expected to be installed in a business or commercial environment. Class B devices are those that may reasonably be expected to be installed in a residential environment (for example, personal computers). The FCC requires devices in both classes to bear a label indicating the interference potential of the device as well as additional operating instructions for the user.

The rating label on the device shows the classification (A or B) of the equipment. Class B devices have an FCC logo or FCC ID on the label. Class A devices do not have an FCC logo or ID on the label. After the class of the device is determined, refer to the corresponding statement in the sections below.

Class A Equipment

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at personal expense.

Class B Equipment

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this

equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio or television technician for help.

Declaration of Conformity for Products Marked with FCC Logo—United States Only

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense. The end user of this product should be aware that any changes or modifications made to this equipment without the approval of Hewlett-Packard could result in the product not meeting the Class A limits, in which case the FCC could void the user's authority to operate the equipment.

Modifications

The FCC requires the user to be notified that any changes or modifications made to this device that are not expressly approved by HP may void the user’s authority to operate the equipment.

Network and Serial Cables

Connections to this device must be made with shielded cables with metallic RFI/EMI connector hoods in order to maintain compliance with FCC Rules and Regulations.

Canadian Notice (Avis Canadien)

The Canadian Notice include Class A Equipment and Class B Equipment.

Class A Equipment

This Class A digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations, ICES-003.

Cet appareil numérique de la classe A respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada, NMB-003.

Class B Equipment

This Class B digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de la classe B respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

European Union Notice

Products with the CE Marking comply with both the EMC Directive (89/336/EEC) and the Low Voltage Directive (73/23/EEC) issued by the Commission of the European Community.

Compliance with these directives implies conformity to the following European Norms (the equivalent international standards are in parenthesis):

- EN55022 (CISPR 22)—Electromagnetic Interference
- EN50082-1 (IEC801-2, IEC801-3, IEC801-4)—Electromagnetic Immunity
- EN60950 (IEC950)—Product Safety
- Also approved under UL 1950, 3rd Edition/CSA C22.2 No. 950-95, Safety of Information Technology Equipment

Spécification ATI Classe A (France)

DECLARATION D'INSTALLATION ET DE MISE EN EXPLOITATION d'un matériel de traitement de l'information (ATI), classé A en fonction des niveaux de perturbations radioélectriques émis, définis dans la norme européenne EN 55022 concernant la Compatibilité Electromagnétique.

Germany Noise Declaration

Geräuschemission (Deutschland)
Geräuschemission nach ISO 9296 (33° C):
LpA m 62,4 dB (Beobachterposition)

Japanese Notice

ご使用になっている装置にVCCIマークが付いていましたら、次の説明文をお読み下さい。

この装置は、情報処理装置等電波障害自主規制協議会（VCCI）の基準に基づくクラスB情報技術装置です。この装置は、家庭環境で使用することを目的としていますが、この装置がラジオやテレビジョン受信機に近接して使用されると、受信障害を引き起こすことがあります。
取扱説明書に従って正しい取り扱いをして下さい。

VCCIマークが付いていない場合には、次の点にご注意下さい。

この装置は、情報処理装置等電波障害自主規制協議会（VCCI）の基準に基づくクラスA情報技術装置です　この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。

VCCI EMC Statement (Japan)

この装置は、情報処理装置等電波障害自主規制協議会（ＶＣＣＩ）の基準に基づくクラスＡ情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。

Harmonics Conformance (Japan)

高調波ガイドライン適合品

Taiwanese Notice

警告使用者：

這是甲類的資訊產品，在居住的環境中使用時，可能會造成射頻干擾，在這種情況下，使用者會被要求採取某些適當的對策。

BSMI EMC Statement (Taiwan)

警告使用者：這是甲類的資訊產品，在居住的環境中使用時，可能會造成射頻干擾，在這種情況下，使用者會被要求採取某些適當的對策。

RRL EMC Statement (Korea)

사용자 안내문 : A 급기기

이기기는 업무용으로 전자파 적합등록을 받은 기기이오니, 판매자 또는 사용자는 이점을 주의하시기 바라며, 만약 잘못 구입하셨을 때에는 구입한 곳에서 비업무용으로 교환하시기 바랍니다.

Laser Devices

All systems equipped with a laser device comply with safety standards, including International Electrotechnical Commission (IEC) 825. With specific regard to the laser, the equipment complies with laser product performance standards set by government agencies as a Class 1 laser product. The product does not emit hazardous light; the beam is totally enclosed during all modes of customer operation and maintenance.

Laser Safety Warnings

To reduce the risk of exposure to hazardous radiation:

- Do not try to open the laser device enclosure. There are no user-serviceable components inside.
- Do not operate controls, make adjustments, or perform procedures to the laser device other than those specified herein.
- Allow only authorized service technicians to repair the laser device.

Compliance with CDRH Regulations

The Center for Devices and Radiological Health (CDRH) of the U.S. Food and Drug Administration implemented regulations for laser products on August 2, 1976. These regulations apply to laser products manufactured from August 1,1976. Compliance is mandatory for products marketed in the United States.

Compliance with International Regulations

All systems equipped with laser devices comply with appropriate safety standards including IEC 825.

Laser Product Label

The following label or equivalent is located on the surface of the laser device.

This label indicates that the product is classified as a CLASS 1 LASER PRODUCT. This label appears on a laser device installed in your product.

This label indicates that the product is classified as a CLASS 1 LASER PRODUCT. This label appears on a laser device installed in your product.

Laser Information

Feature	Description
Laser Type	Semiconductor GaAlAs
Wave Length	780 nm ± 35 nm
Divergence Angle	53.5 degrees ± 0.5 degrees
Output Power	Less than 0.2 mW or 10,869 W·m-2 sr-1
Polarization	Circular 0.25
Numerical Aperture	0.45 inches ± 0.04 inches

Laser Safety

Certification and Classification Information

When equipped with native Fibre Channel adapters, this product contains a laser internal to the small form factor pluggable (SFP) transceiver modules.

In the USA, the SFP module is certified as a Class 1 Laser product, conforming to the requirements contained in Department Of Health and Human Services (DHHS) regulation 21 CFR, Subchapter J. The certification is indicated by a label on the metal SFP housing.

Outside the USA, the SFP is certified as a Class 1 Laser product conforming to requirements contained in IEC 825-1:1993 and EN60825-1:1994, including Amendment 11:1996.

The SFP includes the following certifications:

- UL Recognized Component (USA)
- CSA Certified Component (Canada)
- TUV Certified Component (European Union)
- CB Certificate (Worldwide)

The following figure shows the Class 1 information label that appears on the metal housing of the SFP.

Product Information

Each communications port consists of a transmitter and receiver optical subassembly. The transmitter subassembly contains internally a semiconductor laser diode in the wavelength of either 850 nanometers (shortwave laser) or 1310 nanometers (longwave laser).

Class 1 Laser products are not considered hazardous.

WARNING: There are no user maintenance operations, service operations, or adjustments to be performed on the SFP module.

Usage Restrictions

Failure to comply with these usage restrictions may result in incorrect operation of the system and points of access may emit laser radiation above the Class 1 limits established by the IEC and U.S. DHHS.

Battery Replacement Notice

Your switch is equipped with a lithium manganese dioxide, a vanadium pentoxide, or an alkaline internal battery or battery pack. There is a danger of explosion and risk of personal injury if the battery is incorrectly replaced or mistreated. Replacement is to be done by an authorized service provider using the spare designated for this product. For more information about battery replacement or proper disposal, contact your authorized reseller or your authorized service provider.

WARNING: Your switch contains an internal lithium manganese dioxide, a vanadium pentoxide, or an alkaline battery. There is risk of fire and burns if the battery is not handled properly. To reduce the risk of personal injury:

- Do not attempt to recharge the battery.
- Do not expose to temperatures higher than 140°F (60°C).
- Do not disassemble, crush, puncture, short external contacts, or dispose of in fire or water.

Batteries, battery packs, and accumulators should not be disposed of with the general household waste. In order to forward them to recycling or proper disposal, please use the public collection system or return them to your authorized agents.

Battery Disposal Statement

Bij dit produkt zijn batterijen geleverd. Wanneer deze leeg zijn, moet u ze niet weggooien maar inleveren als KCA.

Regulatory Certifications

The Core Switch 2/64 is certified for the safety and EMC (electromagnetic compatibility) specifications listed in Table 21.

Table 21: Core Switch 2/64 Regulatory Certifications

Country	Safety Specification	EMC Specification
Canada	CSA 22.2 No. 60950 Third Ed.	ICES-003 Class A
United States	UL 60950 Third Ed., Info. Tech. Equip.	FCC Part 15, Subpart B, (CFR title 47) Class A
Japan	IEC 60950+A1+A2+A3+A4+A11	VCCI V-3/2000.04, Class A
International	IEC 60950+A1+A2+A3+A4+A11	CISPR22 Class A
Norway	IEC 60950+A1+A2+A3+A4+A11 (NEMKO CB Report)	
European Union (Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, United Kingdom)	EN 60950:92 +A1:93+A2:93+A3:95+A4:96 +A11:97 73/23/EEC TUV (Germany only) EN60825-1:1994/A11, -2	89/336/EEC EN 55022:1998 Class A EN 55024 (Immunity) EN 61000-4-2 Severity Level 3 for Electrostatic Discharge EN 61000-4-3 Severity Level 3 for Radiated Fields EN 61000-4-4 Severity Level 3 for Electrical Fast Transients EN 61000-4-5 Severity Level 3 for Surge Voltage EN 61000-4-6 Conducted Emissions EN 61000-4-11 Line Interruption
Australia and New Zealand		AS/NZS 3548:1995 Class A (radio interference)
Korea		RRL Certification Korean Radio Wave Law
Taiwan		BSMI Certification CNS 13438

Electrostatic Discharge Summary

To prevent damaging the system, be aware of the precautions you need to follow when setting up the system or handling parts. A discharge of static electricity from a finger or other conductor may damage system boards or other static-sensitive devices. This type of damage may reduce the life expectancy of the device

To prevent electrostatic damage, observe the following precautions:

- Avoid hand contact by transporting and storing products in static-safe containers
- Keep electrostatic-sensitive parts in their containers until they arrive at static-free workstations.
- Place parts on a grounded surface before removing them from their containers.
- Avoid touching pins, leads, or circuitry.
- Always make sure you are properly grounded when touching a static-sensitive component or assembly.

Grounding Methods

There are several methods for grounding. Use one or more of the following methods when handling or installing electrostatic-sensitive parts:

- Use a wrist strap connected by a ground cord to a grounded workstation or computer chassis. Wrist straps are flexible straps with a minimum of 1 megohm ± 10 percent resistance in the ground cords. To provide proper ground, wear the strap snug against the skin.
- Use heel straps, toe straps, or boot straps at standing workstations. Wear the straps on both feet when standing on conductive floors or dissipating floor mats.
- Use conductive field service tools.
- Use a portable field service kit with a folding static-dissipating work mat.

If you do not have any of the suggested equipment for proper grounding, have a HP authorized reseller install the part.

Note: For more information on static electricity, or for assistance with product installation, contact your HP authorized reseller.

Setting Up and Configuring Modems

D

This appendix describes how to set up and configure modems, and includes the following information:

Setting Up and Installing Modems

Each CP card in the Core Switch 2/64 contains a modem serial port for connection to a Hayes-compatible modem. The modem serial ports are wired as standard DTE ports and have the same command, log in capabilities, and operational behavior as the terminal serial ports. However, asynchronous informational messages and other unsolicited text are not sent to the modem ports. No additional software is required to use modems with the Core Switch 2/64.

Note: The Core Switch 2/64 detects modems only during power-on, reboot, or a CP card failover sequence. HP recommends setting up the modems before powering on the Core Switch 2/64 or connecting it to the fabric.

High availability of the modem connection can be ensured by connecting a separate modem to each CP card, and then connecting both modems to a shared telephone line, as shown in Figure 46. This ensures an available telephone connection to the active CP card even if a failover occurs; however, it is necessary to log back in after a failover. When both CP cards are connected to a shared telephone line, callers are automatically dialed into the active CP card, which answers on the first ring. If the active CP card cannot answer for any reason, the standby CP card answers on the seventh ring and allows login to proceed.

After the modems are connected, you can use a telco system to dial-in to the modems and verify that they answer and dialogue as expected. If a dial-out modem facility is not available, you can use a terminal emulation program on a computer that has an attached modem. See Setting Up a Remote Modem System, on page 220 for instructions on setting up a remote modem for testing purposes.

For security reasons, the modem session is automatically disconnected if the modem cable is detached while a session is active.

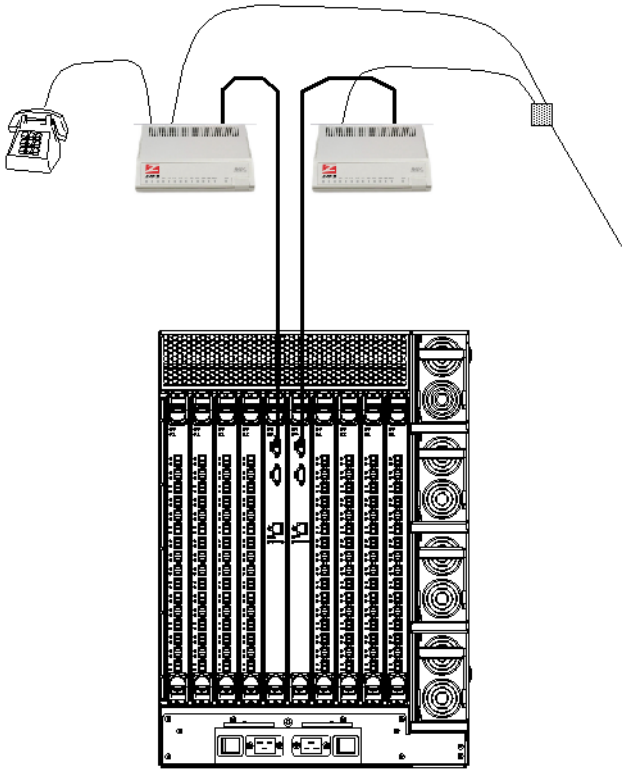


Figure 46: Core Switch 2/64 with two modems connected

Connecting Modems to the Core Switch 2/64

Note: Setting up the modems before powering on the Core Switch 2/64 and connecting it to the fabric is recommended.

The following items are required to set up two modems to work with the Core Switch 2/64:

- Two Hayes-compatible modems, such as the Zoom/Modem V.92 EXT Model 3049
- Two standard modem cables, DB25 (male) to DB9 (female)
- One RJ-11 Y adapter for standard telco wiring or equivalent circuitry (3 total connections)
- One analog telephone line

Caution: HP recommends powering off the Core Switch 2/64 before connecting cables to the modem ports. HP also recommends powering off the Core Switch 2/64 before connecting cables to the modem ports.

To connect modems to the Core Switch 2/64:

1. Optionally power off the Core Switch 2/64.
2. Set up the two modem units and corresponding power connections.

Note: Do not power on the modems until all cables are attached.

3. Connect the modem cables to the modems and to the Core Switch 2/64 RS-232 modem ports, as shown in Figure 46.
4. Connect the telephone line inputs on the modems to the RJ-11 Y connector. This effectively places both modems on a single telephone line.
5. Optionally connect a telephone handset to one of the phone connections on the modems, as shown in Figure 46.

6. Connect the Y adapter to an appropriate analog telephone line, and document the dial-in number for later use.
7. Power on the modems and verify that the Modem Ready indicator illuminates on both units.
8. Power on the Core Switch 2/64, or reboot if it was not powered off during the previous steps.
   This allows the Core Switch 2/64 to recognize the modems.

Setting Up a Remote Modem System

This section provides instructions for setting up a remote modem for testing purposes, using a terminal emulation program on a computer that has an attached modem.

This procedure is only required if a dial-out modem facility is not already available for testing the Core Switch 2/64 modem connections.

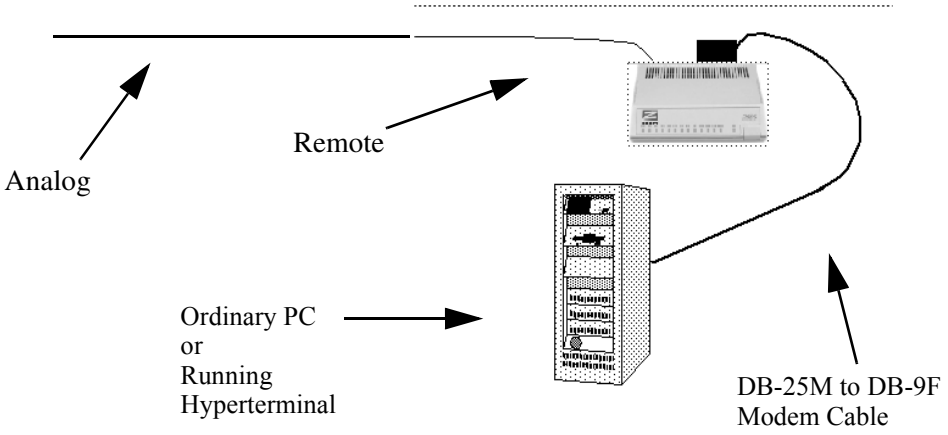


Figure 47: Remote modem setup

To set up the optional remote modem:

1. Connect the remote modem to the workstation, as shown in Figure 47.
2. Disable any serial communication programs running on the workstation (such as a synchronization program for a PDA).
3. Launch the terminal emulator application and configure as described below.

- For Windows systems, or with TERM on a Unix environment, enter the following parameters:

Parameter	Value
Port Speed (bits per second)	115200 *
Data Protocol	Standard EC
Compression	Enabled
Flow control	Hardware
Databits	8
Parity	None
Stop bits	1
Modulation	Standard

  * Port usually defaults to highest speed supported by modem, then may negotiate for slower speed.

- For most UNIX systems, enter the following string at the prompt:

```
tip /dev/ttyb -9600
```

4. Follow the modem manufacturer's instructions for setting up and verifying modem operation.

Verifying the Modem Connection

This section provides information about how to verify that the modems are correctly connected.

Note: This procedure requires either a telco system to dial-in to the modems or a terminal emulation program on a laptop or workstation that has an attached modem. See the section Setting Up a Remote Modem System on page page 220 for information about setting up a remote modem with a terminal emulation program.

To verify the modem connection:

1. Verify that both modem cables are firmly connected.
2. Power on the modems, if not already on.

Note: The modems must be powered on and operational before the Core Switch 2/64 is powered on, to allow the Core Switch 2/64 to detect the modems during boot.

---

3. Power on the Core Switch 2/64, if not already on.
4. Verify that both modems indicate they are ready by illuminating their Clear to Send (CS), Terminal Ready (TR), and Modem Ready (MR) indicators. If this does not occur, ensure that the modems are connected to a power source and are powered on, and check all modem cable connections.
5. Verify that POST is complete on the Core Switch 2/64 (a minimum of 3 minutes).
6. Dial-in to the telephone number assigned to the Core Switch 2/64, using a telco system to dial-in to the modems or the setup described in the section Setting Up a Remote Modem System.
7. Observe the modem lamps: the Ring Indicator should flash briefly as the telephone rings. If the Ring Indicator does not flash on both units, recheck the incoming telephone lines to the modems.
8. Verify that after one ring, the modem associated with the active CP card (usually in slot 5), illuminates the Off Hook (OH) indicator on the modem, and a login prompt is presented to the remote client.

9. Log into the switch from the remote client as Admin. The default password is password.

Note: If the Off Hook lamp illuminates on the standby CP card modem, recheck the modem cable connection to the active CP card.

---

10. Log out of the modem session.
11. Remove the telco connector from the active CP card modem, leaving the standby CP card's telco line connected to the Y connector.

Note: The modem session is automatically disconnected if the modem cable is detached while a session is active.

---

12. Dial-in to the telephone number assigned to the Core Switch 2/64, as described in step 6.
13. Observe the modem lamps: the Ring Indicator should flash only on the modem connected to the standby CP card.
14. Verify that after seven rings, the Off Hook indicator on the standby CP card modem is illuminated. A login prompt is presented to the remote client, and a message confirms that the standby CP card is being logged into. You can now log in or disconnect the session as desired.
15. Reconnect the telco connector to the active CP card modem.

    The Core Switch 2/64 modems are now ready for use.

Note: Advanced users can use the `hafailover` command to further evaluate the attached modems.
The Core Switch 2/64 requires approximately 5 minutes after a failover or reboot to set up the modems.

---

glossary

This glossary defines terms used in this guide or related to this product and is not a comprehensive glossary of computer terms.

AL_PA
Arbitrated Loop Physical Address; a unique 8-bit value assigned during loop initialization to a port in an arbitrated loop.

Alias Address Identifier
An address identifier recognized by a port in addition to its standard identifier. An alias address identifier may be shared by multiple ports.

Alias AL_PA
An AL_PA value recognized by an L_Port in addition to the AL_PA assigned to the port.

Alias Server
A fabric software facility that supports multicast group management.

API
Application Programming Interface; defined protocol that allows applications to interface with a set of services.

Arbitrated Loop
A shared 100 MBps or 200 MBps Fibre Channel transport structured as a loop. Can support up to 126 devices and one fabric attachment. See also *Topology.*

ASIC
Application Specific Integrated Circuit.

ATM
Asynchronous Transfer Mode; a transport used for transmitting data over LANs or WANs that transmit fixed-length units of data. Provides any-to-any connectivity, and allows nodes to transmit simultaneously.

AW_TOV
Arbitration Wait Time-out Value; the minimum time an arbitrating L_Port waits for a response before beginning loop initialization.

Bandwidth
The total transmission capacity of a cable, link, or system. Usually measured in bps (bits per second). May also refer to the range of transmission frequencies available to a network. See also *Throughput*.

BB_Credit
Buffer-to-buffer credit; the number of frames that can be transmitted to a directly connected recipient or within an arbitrated loop. Determined by the number of receive buffers available.

BER
Bit Error Rate; the rate at which bits are expected to be received in error. Expressed as the ratio of error bits to total bits transmitted. See also *Error.*

Block
As applies to Fibre Channel, upper-level application data that is transferred in a single sequence.

Bridge
Hardware that connects incompatible networks by providing translation for both hardware and software. For example, an ATM gateway can connect a Fibre Channel link to an ATM connection.

Broadcast
The transmission of data from a single source to all devices in the fabric, regardless of zoning.

Buffer-to-buffer Flow Control
Management of the frame transmission rate in either a point-to-point topology or in an arbitrated loop. See also *BB_Credit*.

Cascade
Two or more interconnected Fibre Channel switches. The recommended number of interswitch links is seven. See also *Fabric*, *ISL.*

Chassis
The metal frame in which the switch and switch components are mounted.

Circuit
An established communication path between two ports. Consists of two virtual circuits capable of transmitting in opposite directions. See also *Link*.

Command Line
Interface that depends entirely on the use of commands, such as through telnet or SNMP, and does not involve a GUI.

Community (SNMP)
A relationship between a group of SNMP managers and an SNMP agent, in which authentication, access control, and proxy characteristics are defined. See also *SNMP*.

Connection Initiator
A port that has originated a Class 1 dedicated connection and received a response from the recipient.

Connection Recipient
A port that has received a Class 1 dedicated connection request and transmitted a response to the originator.

CRC
Cyclic Redundancy Check; a check for transmission errors included in every data frame.

Credit
As applies to Fibre Channel, the number of receive buffers available for transmission of frames between ports. See also *BB_Credit*, *EE_Credit*.

Disparity
The relationship of ones and zeros in an encoded character. "Neutral disparity" means an equal number of each, "positive disparity" means a majority of ones, and "negative disparity" means a majority of zeros.

DLS
Dynamic Load Sharing; dynamic distribution of traffic over available paths. Allows for recomputing of routes when an Fx_Port or E_Port changes status.

Domain ID
As applies to switches, a unique number between 1 and 239 that identifies the switch to the fabric and is used in routing frames. Usually automatically assigned by the switch, but can be manually assigned.

E_D_TOV
Error Detect Time-out Value; the minimum amount of time a target waits for a sequence to complete before initiating recovery. Can also be defined as the maximum time allowed for a round-trip transmission before an error condition is declared.

E_Port
Expansion Port; a type of switch port that can be connected to an E_Port on another switch to create an ISL. See also *ISL*.

EE_Credit
End-to-end Credit; the number of receive buffers allocated by a recipient port to an originating port. Used by Class 1 and 2 services to manage the exchange of frames across the fabric between source and destination. See also *End-to-end Flow Control*, *BB_Credit*.

EIA Rack
A storage rack that meets the standards set by the Electronics Industry Association.

Enabled Zone Configuration
The currently enabled configuration of zones. Only one configuration can be enabled at a time.

End-to-end Flow Control
Governs flow of class 1 and 2 frames between N_Ports. See also *EE_Credit*.

Error
As applies to Fibre Channel, a missing or corrupted frame, time-out, loss of synchronization, or loss of signal (link errors).

Exchange
The highest level Fibre Channel mechanism used for communication between N_Ports. Composed of one or more related sequences, and can work in either one or both directions.

F_Port
Fabric Port; a port that is able to transmit under fabric protocol and interface over links. Can be used to connect an N_Port to a switch.

Fabric Name
The unique identifier assigned to a fabric and communicated during login and port discovery.

Fabric
A Fibre Channel network containing two or more switches in addition to hosts and devices. May also be referred to as a switched fabric. See also *Topology*, *SAN*, *Cascade*.

FC-AL-3
The Fibre Channel Arbitrated Loop standard defined by ANSI. Defined on top of the FC-PH standards.

FC-FLA
The Fibre Channel Fabric Loop Attach standard defined by ANSI.

FCIA
Fibre Channel Industry Association. An international organization of Fibre Channel industry professionals. Among other things, provides oversight of ANSI and industry developed standards

FCP
Fibre Channel Protocol; mapping of protocols onto the Fibre Channel standard protocols. For example, SCSI FCP maps SCSI-3 onto Fibre Channel.

Fibre Channel Transport
A protocol service that supports communication between Fibre Channel service providers.

FL_Port
Fabric Loop Port; a port that is able to transmit under fabric protocol and also has arbitrated loop capabilities. Can be used to connect an NL_Port to a switch.

FLOGI
Fabric Login; the process by which an N_Port determines whether a fabric is present, and if so, exchanges service parameters with it.

Frame
The Fibre Channel structure used to transmit data between ports. Consists of a start-of-frame delimiter, header, any optional headers, the data payload, a cyclic redundancy check (CRC), and an end-of-frame delimiter. There are two types of frames: Link control frames (transmission acknowledgements, etc.) and data frames.

FS_ACC
Fibre Channel Services Accept. The information unit used to indicate acceptance of a request for a Fibre Channel service.

FSP
Fibre Channel Service Protocol; the common protocol for all fabric services, transparent to the fabric type or topology.

FSPF
Fabric Shortest Path First; the routing protocol for Fibre Channel switches.

Full Fabric
The licensing that allows multiple E_Ports on a switch, making it possible to create multiple ISL links.

Full-duplex
A mode of communication that allows the same port to simultaneously transmit and receive frames.

Fx_Port
A fabric port that can operate as either an F_Port or FL_Port.

G_Port
Generic Port; a port that can operate as either an E_Port or F_Port. A port is defined as a G_Port when it is not yet connected or has not yet assumed a specific function in the fabric.

Gateway
A device such as a switch that connects different subnets together. A switch can be used as a gateway from the Ethernet to the Fibre Channel. Set the gateway address on one switch to the Fibre Channel IP address of another switch to enable the other switch to forward IP traffic to the ethernet port on the second switch.

Gbps
Gigabits per second (1,062,500,000 bits/second).

GBps
GigaBytes per second (1,062,500,000 bytes/second).

HBA
Host Bus Adapter; the interface card between a server or workstation bus and the Fibre Channel network.

Hub
A Fibre Channel wiring concentrator that collapses a loop topology into a physical star topology. Nodes are automatically added to the loop when active and removed when inactive.

Idle
Continuous transmission of an ordered set over a Fibre Channel link when no data is being transmitted, to keep the link active and maintain bit, byte, and word synchronization.

ISL
Interswitch Link; a Fibre Channel link from the E_Port of one switch to the E_Port of another. See also *E_Port*, *Cascade*.

Isolated E_Port
An E_Port that is online but not operational due to overlapping domain IDs or nonidentical parameters (such as E_D_TOVs).

IU
Information Unit; a set of information as defined by either upper-level process protocol definition or upper-level protocol mapping.

L_Port
Loop Port; a node port (NL_Port) or fabric port (FL_Port) that has arbitrated loop capabilities. An L_Port can be in one of two modes:

- *Fabric mode* Connected to a port that is not loop capable, and using fabric protocol.
- *Loop mode* In an arbitrated loop and using loop protocol. An L_Port in loop mode can also be in participating mode or non-participating mode.

Latency
The period of time required to transmit a frame, from the time it is sent until it arrives.

Link Services
A protocol for link-related actions.

Link
As applies to Fibre Channel, a physical connection between two ports, consisting of both transmit and receive fibers.

LIP
Loop Initialization Primitive; the signal used to begin initialization in a loop. Indicates either loop failure or resetting of a node.

Looplet
A set of devices connected in a loop to a port that is a member of another loop.

MIB
Management Information Base; an SNMP structure to help with device management, providing configuration and device information.

Monitoring State
The state in which a port is monitoring the flow of information for data relevant to the port.

Multicast
The transmission of data from a single source to multiple specified N_Ports (as opposed to all the ports on the network).

Multimode
A fiber optic cabling specification that allows up to 500 meters between devices.

N_Port
Node Port; a port on a node that can connect to a Fibre Channel port or to another N_Port in a point-to-point connection.

NAA
Network Address Authority. An identifier that indicates the format of a network address.

Name Server
Frequently used to indicate Simple Name Server.

NL_Port
Node Loop Port; a node port that has arbitrated loop capabilities. Used to connect an equipment port to the fabric in a loop configuration through an FL_Port.

Node Name
The unique identifier for a node, communicated during login and port discovery.

Node
A Fibre Channel device that contains an N_Port or NL_Port.

Open Originator
The L_Port that wins arbitration in an arbitrated loop and sends an OPN ordered set to the destination port, then enters the Open state.

Open Recipient
The L_Port that receives the OPN ordered set from the open originator, and then enters the Open state.

Phantom Address
An AL_PA value that is assigned to an device that is not physically in the loop. Also known as phantom AL_PA.

A twenty-bit public address created for an 8-bit loop device to allow public devices to access it.

Phantom Device
A device that is not physically in an arbitrated loop, but is logically included through the use of a phantom address.

PLOGI
Port Login; the port-to-port login process by which initiators establish sessions with targets.

Point-to-point
A Fibre Channel topology that employs direct links between each pair of communicating entities. See also *Topology*.

Port Cage
The metal casing extending out of the optical port on the switch, and in which the SFP can be inserted.

Port_Name
The unique identifier assigned to a Fibre Channel port. Communicated during login and port discovery.

POST
Power On Self-Test; a series of tests run by a switch after it is turned on.

Private Device
A device that supports arbitrated loop protocol and can interpret 8-bit addresses, but cannot log into the fabric.

Private Loop
An arbitrated loop that does not include a participating FL_Port.

Private NL_Port
An NL_Port that communicates only with other private NL_Ports in the same loop and does not log into the fabric.

Protocol
A defined method and a set of standards for communication.

Public NL_Port
An NL_Port that logs into the fabric, can function within either a public or a private loop, and can communicate with either private or public NL_Ports.

Public Device
A device that can log into the fabric and support 20-bit addresses (or has 20-bit phantom addresses created for it by the switch).

Public Loop
An arbitrated loop that includes a participating FL_Port, and may contain both public and private NL_Ports.

QuickLoop
A feature that makes it possible to allow private devices within loops to communicate with public and private devices across the fabric through the creation of a larger loop.

May also refer to the arbitrated loop created using this software. A QuickLoop can contain a number of devices or looplets; all devices in the same QuickLoop share a single AL_PA space.

R_A_TOV
Resource Allocation Time-out Value; the maximum time a frame can be delayed in the fabric and still be delivered.

Route
As applies to a fabric, the communication path between two switches. May also apply to the specific path taken by an individual frame, from source to destination.

Routing
The assignment of frames to specific switch ports, according to frame destination.

RR_TOV
Resource Recovery Time-out Value; the minimum time a target device in a loop waits after a LIP before logging out a SCSI initiator.

RSCN
Registered State Change Notification; a switch function that allows notification of fabric changes to be sent from the switch to specified nodes.

RX_ID
Responder Exchange Identifier. A 2-byte field in the frame header used by the responder of the Exchange to identify frames as being part of a particular exchange.

Sequence
A group of related frames transmitted in the same direction between two N_Ports.

Service Rate
The rate at which an entity can service requests.

Single Mode
The fiber optic cabling standard that corresponds to distances of up to 10 km between devices.

SNMP
Simple Network Management Protocol. An internet management protocol that uses either IP for network-level functions and UDP for transport-level functions, or TCP/IP for both. Can be made available over other protocols, such as UDP/IP, because it does not rely on the underlying communication protocols.

Switch Name
The arbitrary name assigned to a switch.

Switch Port
A port on a switch. Switch ports can be E_Ports, F_Ports, or FL_Ports.

Switch
Hardware that routes frames according to Fibre Channel protocol and is controlled by software.

Target
A storage device on a Fibre Channel network.

Tenancy
The time from when a port wins arbitration in a loop until the same port returns to the monitoring state. Also referred to as loop tenancy.

Throughput
The rate of data flow achieved within a cable, link, or system. Usually measured in bps (bits per second).

Topology
As applies to Fibre Channel, the configuration of the Fibre Channel network and the resulting communication paths allowed. There are three possible topologies:

- Point to point - A direct link between two communication ports.
- Switched fabric - Multiple N_Ports linked to a switch by F_Ports.
- Arbitrated loop - Multiple NL_Ports connected in a loop.

Transfer State
The state in which a port can establish circuits with multiple ports without reentering the arbitration cycle for each circuit. This state can only be accessed by an L_Port in the Open state.

Translative Mode
A mode in which private devices can communicate with public devices across the fabric.

Transmission Character
A 10-bit character encoded according to the rules of the 8B/10B algorithm.

Transmission Word
A group of four transmission characters.

Trap (SNMP)
The message sent by an SNMP agent to inform the SNMP management station of a critical error.

Tunneling
A technique for enabling two networks to communicate when the source and destination hosts are both on the same type of network, but are connected by a different type of network.

U_Port
Universal Port; a switch port that can operate as a G_Port, E_Port, F_Port, or FL_Port. A port is defined as a U_Port when it is not connected or has not yet assumed a specific function in the fabric.

UDP
User Datagram Protocol; a protocol that runs on top of IP and provides port multiplexing for upper-level protocols.

ULP_TOV
Upper-level Time-out Value; the minimum time that a SCSI ULP process waits for SCSI status before initiating ULP recovery.

ULP
Upper-level Protocol; the protocol that runs on top of Fibre Channel. Typical upper-level protocols are SCSI, IP, HIPPI, and IPI.

Well-known Address
As pertaining to Fibre Channel, a logical address defined by the Fibre Channel standards as assigned to a specific function, and stored on the switch.

Workstation
A computer used to access and manage the fabric. May also be referred to as a management station or host.

WWN
Worldwide Name; Unique identifier worldwide. Each entity in fabric has separate WWN.

Xmitted Close State
The state in which an L_Port cannot send messages, but can retransmit messages within the loop. A port in the XMITTED CLOSE state cannot attempt to arbitrate.

Zone Configuration
A specified set of zones. Enabling a configuration enables all zones in that configuration.

Zone
A set of devices and hosts attached to the same fabric and configured as being in the same zone. Devices and hosts within the same zone have access permission to others in the zone, but are not visible to any outside the zone.

Zoning
A feature that runs on Fabric OS and allows partitioning of the fabric into logical groupings of devices. Devices in a zone can only access and be accessed by devices in the same zone.

index

F

G

H

I

J

L

M

N

O

P

R

S

T

U

V

W

Z